
PART E
HAZARDOUS MATERIALS, FLAMMABLE AND COMBUSTIBLE LIQUIDS, SPRAY FINISHING

WAC

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WAC 296-24-295 Compressed gases (general requirements).

[Order 73-5, 296-24-295, filed 5/9/73 and Order 73-4, 296-24-295, filed 5/7/73.]

WAC 296-24-29501 Inspection of compressed gas cylinders. Each employer shall determine that compressed gas cylinders under the employer's control are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections shall be conducted as prescribed in the hazardous materials regulations of the department of transportation (49 CFR Parts 171-179 and 14 CFR Part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-29501, filed 7/20/94, effective 9/20/94; Order 73-5, 296-24-29501, filed 5/9/73 and Order 73-4, 296-24-29501, filed 5/7/73.]

WAC 296-24-29503 Compressed gases. The in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars, or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965.

[Order 73-5, 296-24-29503, filed 5/9/73 and Order 73-4, 296-24-29503, filed 5/7/73.]

WAC 296-24-29505 Safety relief devices for compressed gas containers. Compressed gas cylinders, portable tanks, and cargo tanks shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda and S-1.2-1963.

[Order 73-5, 296-24-29505, filed 5/9/73 and Order 73-4, 296-24-29505, filed 5/7/73.]

WAC 296-24-310 Acetylene.

[Order 73-5, 296-24-310, filed 5/9/73 and Order 73-4, 296-24-310, filed 5/7/73.]

WAC 296-24-31001 Cylinders. The in-plant transfer, handling, storage, and utilization of acetylene in cylinders shall be in accordance with Compressed Gas Association Pamphlet G-1-1966.

[Order 73-5, 296-24-31001, filed 5/9/73 and Order 73-4, 296-24-31001, filed 5/7/73.]

WAC 296-24-31003 Piped systems. The piped systems for the in-plant transfer and distribution of acetylene shall be designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G-1.3-1959.

[Order 73-5, 296-24-31003, filed 5/9/73 and Order 73-4, 296-24-31003, filed 5/7/73.]

WAC 296-24-31005 Generators and filling cylinders. Plants for the generation of acetylene and the charging (filling) of acetylene cylinders shall be designed, constructed, and tested in accordance with the standards prescribed in Compressed Gas Association Pamphlet G-1.4-1966.

[Order 73-5, 296-24-31005, filed 5/9/73 and Order 73-4, 296-24-31005, filed 5/7/73.]

WAC 296-24-315 Hydrogen.

[Order 73-5, 296-24-315, filed 5/9/73 and Order 73-4, 296-24-315, filed 5/7/73.]

WAC 296-24-31501 General.

(1) Definitions as used in this section.

- (a) **Gaseous hydrogen system** is one in which the hydrogen is delivered, stored and discharged in the gaseous form to consumer's piping. The system includes stationary or movable containers, pressure regulators, safety relief devices, manifolds, interconnecting piping and controls. The system terminates at the point where hydrogen at service pressure first enters the consumer's distribution piping.
- (b) **Approved**--Means unless otherwise indicated, listed or approved by a nationally recognized testing laboratory. Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.
- (c) **Listed**--See "approved."
- (d) **ASME**--American Society of Mechanical Engineers.

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- (e) **DOT specifications**--Regulations of the department of transportation published in 49 CFR Chapter I.
- (f) **DOT regulations**--See WAC 296-24-315.
- (2) Scope.
 - (a) Gaseous hydrogen systems.
 - (i) WAC 296-24-31503 applies to the installation of gaseous hydrogen systems on consumer premises where the hydrogen supply to the consumer premises originates outside the consumer premises and is delivered by mobile equipment.
 - (ii) WAC 296-24-31503 does not apply to gaseous hydrogen systems having a total hydrogen content of less than four hundred cubic feet, nor to hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or their agent for the purpose of storing hydrogen and refilling portable containers, trailers, mobile supply trucks, or tank cars.
 - (b) Liquefied hydrogen systems.
 - (i) WAC 296-24-31505 applies to the installation of liquefied hydrogen systems on consumer premises.
 - (ii) WAC 296-24-31505 does not apply to liquefied hydrogen portable containers of less than one hundred fifty liters (39.63 gallons) capacity; nor to liquefied hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or supplier's agent for the sole purpose of storing liquefied hydrogen and refilling portable containers, trailers, mobile supply trucks or tank cars.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-31501, filed 7/20/94, effective 9/20/94; 88-23-054 (Order 88-25), 296-24-31501, filed 11/14/88; Order 73-5, 296-24-31501, filed 5/9/73 and Order 73-4, 296-24-31501, filed 5/7/73.]

WAC 296-24-31503 Gaseous hydrogen systems.

- (1) Design.
 - (a) Containers.
 - (i) Hydrogen containers shall comply with one of the following:
 - (A) Designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII--Unfired Pressure Vessels--1968.
 - (B) Designed, constructed, tested and maintained in accordance with U.S. Department of Transportation specifications and regulations.
 - (ii) Permanently installed containers shall be provided with substantial noncombustible supports on firm noncombustible foundations.
 - (iii) Each portable container shall be legibly marked with the name "hydrogen" in accordance with "marking compressed gas containers to identify the material contained" ANSI Z48.1-1954. Each manifolded hydrogen supply unit shall be legibly marked with the name hydrogen or a legend such as "this unit contains hydrogen."

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- (b) Safety relief devices.
 - (i) Hydrogen containers shall be equipped with safety relief devices as required by the ASME Boiler and Pressure Vessel Code, Section VIII Unfired Pressure Vessels, 1968 or the DOT specifications and regulations under which the container is fabricated.
 - (ii) Safety relief devices shall be arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container, adjacent structure or personnel. This requirement does not apply to DOT specification containers having an internal volume of 2 cubic feet or less.
 - (iii) Safety relief devices or vent piping shall be designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.
- (c) Piping, tubing, and fittings.
 - (i) Piping, tubing, and fittings shall be suitable for hydrogen service and for the pressures and temperatures involved. Cast iron pipe and fittings shall not be used.
 - (ii) Piping and tubing shall conform to Section 2--"Industrial Gas and Air Piping"--Code for Pressure Piping, ANSI B31.1-1967 with addenda B31.1-1969.
 - (iii) Joints in piping and tubing may be made by welding or brazing or by use of flanged, threaded, socket, or compression fittings. Gaskets and thread sealants shall be suitable for hydrogen service.
- (d) Equipment assembly.
 - (i) Valves, gauges, regulators, and other accessories shall be suitable for hydrogen service.
 - (ii) Installation of hydrogen systems shall be supervised by personnel familiar with proper practices with reference to their construction and use.
 - (iii) Storage containers, piping, valves, regulating equipment, and other accessories shall be readily accessible, and shall be protected against physical damage and against tampering.
 - (iv) Cabinets or housings containing hydrogen control or operating equipment shall be adequately ventilated.
 - (v) Each mobile hydrogen supply unit used as part of a hydrogen system shall be adequately secured to prevent movement.
 - (vi) Mobile hydrogen supply units shall be electrically bonded to the system before discharging hydrogen.
- (e) Marking. The hydrogen storage location shall be permanently placarded as follows: "hydrogen--flammable gas--no smoking--no open flames," or equivalent.
- (f) Testing. After installations, all piping, tubing, and fittings shall be tested and proved hydrogen gas tight at maximum operating pressure.

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(2) Location.

(a) General.

- (i) The system shall be located so that it is readily accessible to delivery equipment and to authorized personnel.
- (ii) Systems shall be located above ground.
- (iii) Systems shall not be located beneath electric power lines.
- (iv) Systems shall not be located close to flammable liquid piping or piping of other flammable gases.
- (v) Systems near aboveground flammable liquid storage shall be located on ground higher than the flammable liquid storage except when dikes, diversion curbs, grading, or separating solid walls are used to prevent accumulation of flammable liquids under the system.

(b) Specific requirements.

- (i) The location of a system, as determined by the maximum total contained volume of hydrogen, shall be in the order of preference as indicated by Roman numerals in

Table H-1			
Nature of location	Size of hydrogen system		
	Less than 300 CFF	300 CF to 15,000 CF	In excess of 15,000 CF
Outdoors	I	I	I.
In a separate building	II	II	II.
In a special room	III	III	Not permitted.
Inside buildings not in a special room and exposed to other occupancies	IV	Not permitted	Not permitted.

- (ii) The minimum distance in feet from a hydrogen system of indicated capacity located outdoors, in separate buildings or in special rooms to any specified outdoor exposure shall be in accordance with Table H-2.
- (iii) The distances in Table H-2 Items 1, 14, and 3 to 10 inclusive do not apply where protective structures such as adequate fire walls are located between the system and the exposure.
- (iv) Hydrogen systems of less than 3,000 CF when located inside buildings and exposed to other occupancies shall be situated in the building so that the system will be as follows:
 - (A) In an adequately ventilated area as in (3)(b)(ii) of this section.
 - (B) Twenty feet from stored flammable materials or oxidizing gases.

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- (C) Twenty-five feet from open flames, ordinary electrical equipment or other sources of ignition.
 - (D) Twenty-five feet from concentrations of people.
 - (E) Fifty feet from intakes of ventilation or air-conditioning equipment and air compressors.
 - (F) Fifty feet from other flammable gas storage.
 - (G) Protected against damage or injury due to falling objects or working activity in the area.
 - (H) More than one system of 3,000 CF or less may be installed in the same room, provided the systems are separated by at least 50 feet. Each such system shall meet all of the requirements of this section.
- (3) Design consideration at specific locations.
 - (a) Outdoor locations.
 - (i) Where protective walls or roofs are provided, they shall be constructed of noncombustible materials.
 - (ii) Where the enclosing sides adjoin each other, the area shall be properly ventilated.
 - (iii) Electrical equipment shall meet the requirements for Class I, Division 2 hazardous locations of WAC 296-24-95613.
 - (b) Separate buildings.
 - (i) Separate buildings shall be built of at least noncombustible construction. Windows and doors shall be located so as to be readily accessible in case of emergency. Windows shall be of glass or plastic in metal frames.
 - (ii) Adequate ventilation to the outdoors shall be provided. Inlet openings shall be located near the floor in exterior walls only. Outlet openings shall be located at the high point of the room in exterior walls or roof. Inlet and outlet openings shall each have minimum total area of one square foot per 1,000 cubic feet of room volume. Discharge from outlet openings shall be directed or conducted to a safe location.
 - (iii) Explosion venting shall be provided in exterior walls or roof only. The venting area shall be equal to not less than 1 square foot per 30 cubic feet of room volume and may consist of any one or any combination of the following: Walls of light noncombustible material, preferably single thickness, single strength glass; lightly fastened hatch covers; lightly fastened swinging doors in exterior walls opening outward; lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot.
 - (iv) There shall be no sources of ignition from open flames, electrical equipment, or heating equipment.
 - (v) Electrical equipment shall meet the requirements of chapter 296-24 WAC Part L.

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- (vi) Heating, if provided, shall be by steam, hot water, or other indirect means.
- (c) Special rooms.
 - (i) Floor, walls, and ceiling shall have a fire-resistance rating of at least 2 hours. Walls or partitions shall be continuous from floor to ceiling and shall be securely anchored. At least one wall shall be an exterior wall. Openings to other parts of the building shall not be permitted. Windows and doors shall be in exterior walls and shall be located so as to be readily accessible in case of emergency. Windows shall be of glass or plastic in metal frames.
 - (ii) Ventilation shall be as provided in (3)(b)(ii) of this section.
 - (iii) Explosion venting shall be as provided in (3)(b)(iii) of this section.
 - (iv) There shall be no sources of ignition from open flames, electrical equipment or heating equipment.
 - (v) Electrical equipment shall meet the requirements of chapter 296-24 WAC Part L.
 - (vi) Heating, if provided, shall be by steam, hot water, or indirect means.
- (4) Operating instructions. For installations which require any operation of equipment by the user, legible instructions shall be maintained at operating locations.
- (5) Maintenance.
 - (a) The equipment and functioning of each charged gaseous hydrogen system shall be maintained in a safe operating condition in accordance with the requirements of this section. The area within 15 feet of any hydrogen container shall be kept free of dry vegetation and combustible material.

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TABLE H-2					
Type of outdoor exposure			Size of hydrogen system		
			Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
1.	Building or structure	Wood frame construction* Heavy timber, noncombustible or ordinary construction* Fire-restrictive construction*	10 0 0	25 10 0	50 **25 0
2.	Wall openings	Not above any part of a system Above any part of a system	10 25	10 25	10 25
3.	Flammable liquids above ground	0 to 1,000 gallons In excess of 1,000 gallons	10 25	25 50	25 50
4.	Flammable liquids below ground--0 to 1,000 gallons	Tank Vent or fill opening of tank	10 25	10 25	10 25
5.	Flammable liquids below ground--in excess of 1,000 gallons	Tank Vent or fill opening of tank	20 25	20 25	20 25
6.	Flammable gas storage, either high pressure or low pressure	0 to 15,000 CF capacity In excess of 15,000 CF capacity	10 25	25 50	25 50
7.	Oxygen storage	12,000 CF or less	Refer to NFPA No. 51, gas systems for welding and cutting (1969)		
		More than 12,000 CF	Refer to NFPA No. 566, bulk oxygen systems at consumer sites (1969)		
8.	Fast burning solids such as ordinary lumber, excelsior or paper		50	50	25
9.	Slow burning solids such as heavy timber or coal		25	25	25
10.	Open flames and other sources or ignition		25	25	50
11.	Air compressor intakes or inlets to ventilating or air-condition equipment		50	50	50
12.	Concentration of people		25	50	50
13.	Public sidewalks		15	15	15
14.	Line of adjoining property which may be built upon		5	5	5

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*Refer to NFPA No. 220 standard types of building construction for definitions of various types of construction. (1969 Ed.)

**But not less than one-half the height of adjacent side wall of the structure.

***In congested areas such as offices, lunchrooms, locker rooms, time-clock areas, and places of public assembly.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-31503, filed 11/22/91, effective 12/24/91; 88-23-054 (Order 88-25), 296-24-31503, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-31503, filed 4/19/85; Order 76-6, 296-24-31503, filed 3/1/76; Order 73-5, 296-24-31503, filed 5/9/73 and Order 73-4, 296-24-31503, filed 5/7/73.]

WAC 296-24-31505 Liquefied hydrogen systems.

(1) Design.

(a) Containers.

(i) Hydrogen containers shall comply with the following: Storage containers shall be designed, constructed, and tested in accordance with appropriate requirements of the ASME Boiler and Pressure Vessel Code, Section VIII--Unfired Pressure Vessels (1968) or applicable provisions of API Standard 620, Recommended Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Second Edition (June 1963) and Appendix R (April 1965).

(ii) Portable containers shall be designed, constructed and tested in accordance with DOT specifications and regulations.

(b) Supports. Permanently installed containers shall be provided with substantial noncombustible supports securely anchored on firm noncombustible foundations. Steel supports in excess of 18 inches in height shall be protected with a protective coating having a 2-hour fire-resistance rating.

(c) Marking. Each container shall be legibly marked to indicate "liquefied hydrogen--flammable gas."

(d) Safety relief devices.

(i) Stationary liquefied hydrogen containers shall be equipped with safety relief devices sized in accordance with CGA Pamphlet S-1-1966, Part 3, Safety Relief Device Standards for Compressed Gas Storage Containers.

(A) Portable liquefied hydrogen containers complying with the U.S. Department of Transportation regulations shall be equipped with safety relief devices as required in the U.S. Department of Transportation specifications and regulations. Safety relief devices shall be sized in accordance with the requirements of CGA Pamphlet S-1-1966, Safety Relief Device Standards, Part 1, Compressed Gas Cylinders and Part 2, Cargo and Portable Tank Containers.

(ii) Safety relief devices shall be arranged to discharge unobstructed to the outdoors and in such a manner as to prevent impingement of escaping liquid or gas upon the container, adjacent structures or personnel. See (2)(a)(vi) of this section for venting of safety relief devices in special locations.

(iii) Safety relief devices or vent piping shall be designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.

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- (iv) Safety relief devices shall be provided in piping wherever liquefied hydrogen could be trapped between closures
- (e) Piping, tubing, and fittings.
 - (i) Piping, tubing, and fittings and gasket and thread sealants shall be suitable for hydrogen service at the pressures and temperatures involved. Consideration shall be given to the thermal expansion and contraction of piping systems when exposed to temperature fluctuations of ambient to liquefied hydrogen temperatures.
 - (ii) Gaseous hydrogen piping and tubing (above--20°F) shall conform to the applicable sections of Pressure Piping Section 2--Industrial Gas and Air Piping, ANSI B31.1-1967 with addenda B31.1-1969. Design of liquefied hydrogen or cold (-20°F or below) gas piping shall use Petroleum Refinery Piping ANSI B31.3-1966 or Refrigeration Piping ANSI B31.5-1966 with addenda B31.5a-1968 as a guide.
 - (iii) Joints in piping and tubing shall preferably be made by welding or brazing; flanged, threaded, socket, or suitable compression fittings may be used.
 - (iv) Means shall be provided to minimize exposure of personnel to piping operating at low temperatures and to prevent air condensate from contacting piping, structural members, and surfaces not suitable for cryogenic temperatures. Only those insulating materials which are rated nonburning in accordance with ASTM Procedures D1692-68 may be used. Other protective means may be used to protect personnel. The insulation shall be designed to have a vapor-tight seal in the outer covering to prevent the condensation of air and subsequent oxygen enrichment within the insulation. The insulation material and outside shield shall also be of adequate design to prevent attrition of the insulation due to normal operating conditions.
 - (v) Uninsulated piping and equipment which operate at liquefied-hydrogen temperature shall not be installed above asphalt surfaces or other combustible materials in order to prevent contact of liquid air with such materials. Drip pans may be installed under uninsulated piping and equipment to retain and vaporize condensed liquid air.
- (f) Equipment assembly.
 - (i) Valves, gauges, regulators, and other accessories shall be suitable for liquefied hydrogen service and for the pressures and temperatures involved.
 - (ii) Installation of liquefied hydrogen systems shall be supervised by personnel familiar with proper practices and with reference to their construction and use.
 - (iii) Storage containers, piping, valves, regulating equipment, and other accessories shall be readily accessible and shall be protected against physical damage and against tampering. A shutoff valve shall be located in liquid product withdrawal lines as close to the container as practical. On containers of over 2,000 gallons capacity, this shutoff valve shall be of the remote control type with no connections, flanges, or other appurtenances (other than a welded manual shutoff valve) allowed in the piping between the shutoff valve and its connection to the inner container.
 - (iv) Cabinets or housings containing hydrogen control equipment shall be ventilated to prevent any accumulation of hydrogen gas.

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- (g) Testing.
 - (i) After installation, all field-erected piping shall be tested and proved hydrogen gas-tight at operating pressure and temperature.
 - (ii) Containers if out of service in excess of 1 year shall be inspected and tested as outlined in (1) of this section. The safety relief devices shall be checked to determine if they are operable and properly set.
 - (h) Liquefied hydrogen vaporizers.
 - (i) The vaporizer shall be anchored and its connecting piping shall be sufficiently flexible to provide for the effect of expansion and contraction due to temperature changes.
 - (ii) The vaporizer and its piping shall be adequately protected on the hydrogen and heating media sections with safety relief devices.
 - (iii) Heat used in a liquefied hydrogen vaporizer shall be indirectly supplied utilizing media such as air, steam, water, or water solutions.
 - (iv) A low temperature shutoff switch shall be provided in the vaporizer discharge piping to prevent flow of liquefied hydrogen in the event of the loss of the heat source.
 - (i) Electrical systems.
 - (i) Electrical wiring and equipment located within 3 feet of a point where connections are regularly made and disconnected, shall meet the requirements of chapter 296-24 WAC Part L for Class I, Division 1 locations.
 - (ii) Except as provided in (1) of this section, electrical wiring, and equipment located within 25 feet of a point where connections are regularly made and disconnected or within 25 feet of a liquid hydrogen storage container, shall meet the requirements of chapter 296-24 WAC Part L for Class I, Division 2 locations. When equipment approved for Class I, environments is not commercially available, the equipment may be:
 - (A) Purged or ventilated in accordance with NFPA No. 496-1967, Standard for Purged Enclosures for Electrical Equipment in Hazardous Locations,
 - (B) Intrinsically safe, or
 - (C) Approved for Class I, Group C atmospheres. This requirement does not apply to electrical equipment which is installed on mobile supply trucks or tank cars from which the storage container is filled.
 - (j) Bonding and grounding. The liquefied hydrogen container and associated piping shall be electrically bonded and grounded.
- (2) Location of liquefied hydrogen storage.
- (a) General requirements.
 - (i) The storage containers shall be located so that they are readily accessible to mobile supply equipment at ground level and to authorized personnel.

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- (ii) The containers shall not be exposed by electric power lines, flammable liquid lines, flammable gas lines, or lines carrying oxidizing materials.
 - (iii) When locating liquefied hydrogen storage containers near above-ground flammable liquid storage or liquid oxygen storage, locate the liquefied hydrogen container on ground higher than flammable liquid storage or liquid oxygen storage.
 - (iv) Where it is necessary to locate the liquefied hydrogen container on ground that is level with or lower than adjacent flammable liquid storage or liquid oxygen storage, suitable protective means shall be taken (such as by diking, diversion, curbs, grading), with respect to the adjacent flammable liquid storage or liquid oxygen storage, to prevent accumulation of liquids within 50 feet of the liquefied hydrogen container.
 - (v) Storage sites shall be fenced and posted to prevent entrance by unauthorized personnel. Sites shall also be placarded as follows: "Liquefied hydrogen--Flammable gas--No smoking--No open flames."
 - (vi) If liquefied hydrogen is located in (as specified in Table H-3) a separate building, in a special room, or inside buildings when not in a special room and exposed to other occupancies, containers shall have the safety relief devices vented unobstructed to the outdoors at a minimum elevation of 25 feet above grade to a safe location as required in (l)(d)(ii) of this section.
- (b) Specific requirements.
- (i) The location of liquefied hydrogen storage, as determined by the maximum total quantity of liquefied hydrogen, shall be in the order of preference as indicated by Roman numerals in the following Table H-3.

TABLE H-3 MAXIMUM TOTAL QUANTITY OF LIQUEFIED HYDROGEN STORAGE PERMITTED				
Nature of location	Size of hydrogen storage (capacity in gallons)			
	39.63 (150 liters) to 50	51 to 300	301 to 600	In excess of 600
Outdoors	I	I	I	I
In a separate building	II	II	II	Not permitted.
In a special room	III	III	Not permitted.	Not permitted.

Note: This table does not apply to the storage in dewars of the type generally used in laboratories for experimental purposes.

- (ii) The minimum distance in feet from liquefied hydrogen systems of indicated storage capacity located outdoors, in a separate building, or in a special room to any specified exposure shall be in accordance with Table H-4.

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TABLE H-4 MINIMUM DISTANCE (FEET) FROM LIQUEFIED HYDROGEN SYSTEMS TO EXPOSURE			
Type of exposure	Liquefied hydrogen storage (capacity in gallons)		
	39.63 (150 liters) to 3,500	3,501 to 15,000	15,001 to 30,000
1. Fire-resistive building and fire walls*	5	5	5
2. Noncombustible building*	25	50	75
3. Other buildings*	50	75	100
4. Wall openings, air-compressor intakes, inlets for air-conditioning or ventilating equipment	75	75	75
5. Flammable liquids (aboveground) and vent or fill openings if below ground) see 513 and 514)	50	75	100
6. Between stationary liquefied hydrogen containers	5	5	5
7. Flammable gas storage	50	75	100
8. Liquid oxygen storage and other oxidizers (see 513 and 514)	100	100	100
9. Combustible solids	50	75	100
10. Open flames, smoking, and welding	50	50	50
11. Concentrations of people**	75	75	75
12. Public ways, railroads, and property lines	25	50	75

* Refer to standard types of building construction, NFPA No. 220-1969 for definitions of various types of construction.

** In congested areas such as offices, lunchrooms, locker rooms, time-clock areas, and places of public assembly.

Note 1: The distance in Nos. 2, 3, 5, 7, 9, and 12 in Table H-4 may be reduced where protective structures, such as firewalls equal to height of top of the container, to safeguard the liquefied hydrogen storage system, are located between the liquefied hydrogen storage installation and the exposure.

Note 2: Where protective structures are provided, ventilation and confinement of product should be considered. The 5-foot distance in Nos. 1 and 6 facilitates maintenance and enhances ventilation.

(c) Handling of liquefied hydrogen inside buildings other than separate buildings and special rooms. Portable liquefied hydrogen containers of 50 gallons or less capacity as permitted in Table H-3 and in compliance with (2)(a)(vi) of this section when housed inside buildings not located in a special room and exposed to other occupancies shall comply with the following minimum requirements:

- (i) Be located 20 feet from flammable liquids and readily combustible materials such as excelsior or paper.
- (ii) Be located 25 feet from ordinary electrical equipment and other sources of ignition including process or analytical equipment.
- (iii) Be located 25 feet from concentrations of people.
- (iv) Be located 50 feet from intakes of ventilation and air-conditioning equipment or intakes of compressors.
- (v) Be located 50 feet from storage of other flammable-gases or storage of oxidizing gases.
- (vi) Containers shall be protected against damage or injury due to falling objects or work activity in the area.

WAC 296-24-31505 (Cont.)

- (vii) Containers shall be firmly secured and stored in an upright position.
 - (viii) Welding or cutting operations, and smoking shall be prohibited while hydrogen is in the room.
 - (ix) The area shall be adequately ventilated. Safety relief devices on the containers shall be vented directly outdoors or to a suitable hood. See (1)(d)(ii) of this section and (2)(a)(vi) of this section.
- (3) Design considerations at specific locations.
 - (a) Outdoor locations.
 - (i) Outdoor location shall mean outside of any building or structure, and includes locations under a weather shelter or canopy provided such locations are not enclosed by more than two walls set at right angles and are provided with vent-space between the walls and vented roof or canopy.
 - (ii) Roadways and yard surfaces located below liquefied hydrogen piping, from which liquid air may drop, shall be constructed of noncombustible materials.
 - (iii) If protective walls are provided, they shall be constructed of noncombustible materials and in accordance with the provisions of (3)(a)(i) of this section as applicable.
 - (iv) Electrical wiring and equipment shall comply with chapter 296-24 WAC Part L.
 - (v) Adequate lighting shall be provided for nighttime transfer operation.
 - (b) Separate buildings.
 - (i) Separate buildings shall be of light noncombustible construction on a substantial frame. Walls and roofs shall be lightly fastened and designed to relieve at a maximum internal pressure of 25 pounds per square foot. Windows shall be of shatterproof glass or plastic in metal frames. Doors shall be located in such a manner that they will be readily accessible to personnel in an emergency.
 - (ii) Adequate ventilation to the outdoors shall be provided. Inlet openings shall be located near the floor level in exterior walls only. Outlet openings shall be located at the high point of the room in exterior walls or roof. Both the inlet and outlet vent openings shall have a minimum total area of 1 square foot per 1,000 cubic feet of room volume. Discharge from outlet openings shall be directed or conducted to a safe location.
 - (iii) There shall be no sources of ignition.
 - (iv) Electrical wiring and equipment shall comply with chapter 296-24 WAC Part L.
 - (v) Heating, if provided, shall be by steam, hot water, or other indirect means.
 - (c) Special rooms.
 - (i) Floors, walls, and ceilings shall have a fire resistance rating of at least 2 hours. Walls or partitions shall be continuous from floor to ceiling and shall be securely anchored. At least one wall shall be an exterior wall. Openings to other parts of the building shall not be permitted. Windows and doors shall be in exterior walls and doors shall be located in such a manner that they will be accessible in an emergency. Windows shall be of shatterproof glass or plastic in metal frames.
 - (ii) Ventilation shall be as provided in (3)(b)(ii) of this section.

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- (iii) Explosion venting shall be provided in exterior walls or roof only. The venting area shall be equal to not less than 1 square foot per 30 cubic feet of room volume and may consist of any one or any combination of the following: Walls of light noncombustible material; lightly fastened hatch covers; lightly fastened swinging doors opening outward in exterior walls; lightly fastened walls or roofs designed to relieve at a maximum pressure of 25 pounds per square foot.
 - (iv) There shall be no sources of ignition.
 - (v) Electrical wiring and equipment shall comply with chapter 296-24 WAC Part L.
 - (vi) Heating, if provided, shall be steam, hot water, or by other indirect means.
- (4) Operating instructions.
- (a) Written instructions. For installation which require any operation of equipment by the user, legible instructions shall be maintained at operating locations.
 - (b) Attendant. A qualified person shall be in attendance at all times while the mobile hydrogen supply unit is being unloaded.
 - (c) Security. Each mobile liquefied hydrogen supply unit used as part of a hydrogen system shall be adequately secured to prevent movement.
 - (d) Grounding. The mobile liquefied hydrogen supply unit shall be grounded for static electricity.
- (5) Maintenance.
- (a) The equipment and functioning of each charged liquefied hydrogen system shall be maintained in a safe operating condition in accordance with the requirements of this section. Weeds or similar combustibles shall not be permitted within 25 feet of any liquified hydrogen equipment.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-31505, filed 11/22/91, effective 12/24/91; 88-23-054 (Order 88-25), 296-24-31505, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-31505, filed 4/19/85; Order 76-6, 296-24-31505, filed 3/1/76; Order 73-5, 296-24-31505, filed 5/9/73 and Order 73-4, 296-24-31505, filed 5/7/73.]

WAC 296-24-320 Oxygen.

[Order 73-5, 296-24-320, filed 5/9/73 and Order 73-4, 296-24-320, filed 5/7/73.]

WAC 296-24-32001 Scope. This section applies to the installation of bulk oxygen systems on industrial and institutional consumer premises. This section does not apply to oxygen manufacturing plants or other establishments operated by the oxygen supplier or supplier's agent for the purpose of storing oxygen and refilling portable containers, trailers, mobile supply trucks, or tank cars, nor to systems having capacities less than those stated in WAC 296-24-32003(1).

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-32001, filed 7/20/94, effective 9/20/94; Order 73-5, 296-24-32001, filed 5/9/73 and Order 73-4, 296-24-32001, filed 5/7/73.]

WAC 296-24-32003 Bulk oxygen systems.

- (1) Definitions. As used in this section: A bulk oxygen system is an assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping, which has storage capacity of more than 13,000 cubic feet of oxygen, normal temperature and pressure (NTP), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (NTP) including unconnected reserves on hand at the site. The bulk oxygen system terminates at the point where oxygen at service pressure first enters the supply line. The oxygen containers may be stationary or movable, and the oxygen may be stored as gas or liquid.

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(2) Location.

- (a) General. Bulk oxygen storage systems shall be located above ground out of doors, or shall be installed in a building of noncombustible construction, adequately vented, and used for that purpose exclusively. The location selected shall be such that containers and associated equipment shall not be exposed by electric power lines, flammable or combustible liquid lines, or flammable gas lines.
- (b) Accessibility. The system shall be located so that it is readily accessible to mobile supply equipment at ground level and to authorized personnel.
- (c) Leakage. Where oxygen is stored as a liquid, noncombustible surfacing shall be provided in an area in which any leakage of liquid oxygen might fall during operation of the system and filling of a storage container. For purposes of these standards, asphaltic or bituminous paving is considered to be combustible.
- (d) Elevation. When locating bulk oxygen systems near above ground flammable or combustible liquid storage which may be either indoors or outdoors, it is advisable to locate the system on ground higher than the flammable or combustible liquid storage.
- (e) Dikes. Where it is necessary to locate a bulk oxygen system on ground lower than adjacent flammable or combustible liquid storage suitable means shall be taken (such as by diking, diversion curbs, or grading) with respect to the adjacent flammable or combustible liquid storage to prevent accumulation of liquids under the bulk oxygen system.

(3) Distance between systems and exposures.

- (a) General. The minimum distance from any bulk oxygen storage container to exposures, measured in the most direct line except as indicated in (3)(f) and (g) of this section shall be as indicated in (3)(b) to (r) of this section inclusive.
- (b) Combustible structures. Fifty feet from any combustible structures.
- (c) Fire resistive structures. Twenty-five feet from any structures with fire-resistive exterior walls or sprinklered buildings or other construction, but not less than one-half the height of adjacent side wall of the structure.
- (d) Openings. At least 10 feet from any opening in adjacent walls of fire resistive structures. Spacing from such structures shall be adequate to permit maintenance, but shall not be less than 1 foot.
- (e) Flammable liquid storage above ground.

Distance (feet)	Capacity (gallons)
50	0-1000
90	1001 or more-

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- (f) Flammable liquid storage below ground.

Distance measured horizontally from oxygen storage container to flammable liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to flammable liquid tank (feet)	Capacity (gallons)
15	50	0-1000
30	50	1001 or more

- (g) Combustible liquid storage above ground.

Distance (feet)	Capacity (gallons)
25	0-1000
50	1001 or more-

- (h) Combustible liquid storage below ground.

Distance measured horizontally from oxygen storage container to combustible liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to combustible liquid tank (feet)
15	40

- (i) Flammable gas storage. (Such as compressed flammable gases, liquefied flammable gases and flammable gases in low pressure gas holders):

Distance (feet)	Capacity (cu. ft. NTP)
50	Less than 5000
90	5000 or more

- (j) Highly combustible materials. Fifty feet from solid materials which burn rapidly, such as excelsior or paper.

- (k) Slow-burning materials. Twenty-five feet from solid materials which burn slowly, such as coal and heavy timber.

- (l) Ventilation. Seventy-five feet in one direction and 35 feet in approximately 90° direction from confining walls (not including firewalls less than 20 feet high) to provide adequate ventilation in courtyards and similar confining areas.

- (m) Congested areas. Twenty-five feet from congested areas such as offices, lunchrooms, locker rooms, time clock areas, and similar locations where people may congregate.

- (n) Public areas. Fifty feet from places of public assembly.

- (o) Patients. Fifty feet from areas occupied by nonambulatory patients.

- (p) Sidewalks. Ten feet from any public sidewalk.

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- (q) Adjacent property. Five feet from any line of adjoining property.
 - (r) Exceptions. The distances in (3)(b), (c), (e) to (k) inclusive, and (p) and (q) of this section do not apply where protective structures such as firewalls of adequate height to safeguard the oxygen storage systems are located between the bulk oxygen storage installation and the exposure. In such cases, the bulk oxygen storage installation may be a minimum distance of 1 foot from the firewall.
- (4) Storage containers.
- (a) Foundations and supports. Permanently installed containers shall be provided with substantial noncombustible supports on firm noncombustible foundations.
 - (b) Construction--Liquid. Liquid oxygen storage containers shall be fabricated from materials meeting the impact test requirements of paragraph UG-84 of ASME Boiler and Pressure Vessel Code, Section VIII--Unfired Pressure Vessels--1968. Containers operating at pressures above 15 pounds per square inch gage (p.s.i.g.) shall be designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VII--Unfired Pressure Vessels--1968. Insulation surrounding the liquid oxygen container shall be noncombustible.
 - (c) Construction--Gaseous. High-pressure gaseous oxygen containers shall comply with one of the following:
 - (i) Designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII--Unfired Pressure Vessels--1968.
 - (ii) Designed, constructed, tested, and maintained in accordance with DOT specifications and regulations.
- (5) Piping, tubing, and fittings.
- (a) Selection. Piping, tubing, and fittings shall be suitable for oxygen service and for the pressures and temperatures involved.
 - (b) Specification. Piping and tubing shall conform to Section 2--Gas and Air Piping Systems of Code for Pressure Piping, ANSI, B31.1-1967 with addenda B31.10a-1969.
 - (c) Fabrication. Piping or tubing for operating temperatures below -20°F shall be fabricated from materials meeting the impact test requirements of paragraph UG-84 of ASME Boiler and Pressure Vessel Code, Section VIII--Unfired Pressure Vessels--1968, when tested at the minimum operating temperature to which the piping may be subjected in service.
- (6) Safety relief devices.
- (a) General. Bulk oxygen storage containers, regardless of design pressure shall be equipped with safety relief devices as required by the ASME code or the DOT specifications and regulations.
 - (b) DOT containers. Bulk oxygen storage containers designed and constructed in accordance with DOT specification shall be equipped with safety relief devices as required thereby.

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- (c) ASME containers. Bulk oxygen storage containers designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII--Unfired Pressure Vessel--1968 shall be equipped with safety relief devices meeting the provisions of the Compressed Gas Association Pamphlet "Safety Relief Device Standards for Compressed Gas Storage Containers," S-1, Part 3.
 - (d) Insulation. Insulation casings on liquid oxygen containers shall be equipped with suitable safety relief devices.
 - (e) Reliability. All safety relief devices shall be so designed or located that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.
- (7) Liquid oxygen vaporizers.
 - (a) Mounts and couplings. The vaporizer shall be anchored and its connecting piping be sufficiently flexible to provide for the effect of expansion and contraction due to temperature changes.
 - (b) Relief devices. The vaporizer and its piping shall be adequately protected on the oxygen and heating medium sections with safety relief devices.
 - (c) Heating. Heat used in an oxygen vaporizer shall be indirectly supplied only through media such as steam, air, water, or water solutions which do not react with oxygen.
 - (d) Grounding. If electric heaters are used to provide the primary source of heat, the vaporizing system shall be electrically grounded.
- (8) Equipment assembly and installation.
 - (a) Cleaning. Equipment making up a bulk oxygen system shall be cleaned in order to remove oil, grease or other readily oxidizable materials before placing the system in service.
 - (b) Joints. Joints in piping and tubing may be made by welding or by use of flanged, threaded, slip, or compression fittings. Gaskets or thread sealants shall be suitable for oxygen service.
 - (c) Accessories. Valves, gages, regulators, and other accessories shall be suitable for oxygen service.
 - (d) Installation. Installation of bulk oxygen systems shall be supervised by personnel familiar with proper practices with reference to their construction and use.
 - (e) Testing. After installation all field erected piping shall be tested and proved gas tight at maximum operating pressure. Any medium used for testing shall be oil free and nonflammable.
 - (f) Security. Storage containers, piping, valves, regulating equipment, and other accessories shall be protected against physical damage and against tampering.
 - (g) Venting. Any enclosure containing oxygen control or operating equipment shall be adequately vented.
 - (h) Placarding. The bulk oxygen storage location shall be permanently placarded to indicate: "oxygen--no smoking--no open flames," or an equivalent warning.

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- (i) Electrical wiring. Bulk oxygen installations are not hazardous locations as defined and covered by chapter 296-24 WAC Part L. Therefore, general purpose or weatherproof types of electrical wiring and equipment are acceptable depending upon whether the installation is indoors or outdoors. Such equipment shall be installed according to chapter 296-24 WAC Part L.
- (9) Operating instructions. For installations which require any operation of equipment by the user, legible instructions shall be maintained at operating locations.
- (10) Maintenance.
 - (a) The equipment and functioning of each charged bulk oxygen system shall be maintained in a safe operating condition in accordance with the requirements of this section. Wood and long dry grass shall be cut back within 15 feet of any bulk oxygen storage container.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-32003, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-32003, filed 4/19/85; Order 76-6, 296-24-32003, filed 3/1/76; Order 73-5, 296-24-32003, filed 5/9/73 and Order 73-4, 296-24-32003, filed 5/7/73.]

WAC 296-24-325 Nitrous oxide. The piped systems for the in-plant transfer and distribution of nitrous oxide shall be designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G8.1-1964.

[Order 73-5, 296-24-325, filed 5/9/73 and Order 73-4, 296-24-325, filed 5/7/73.]

WAC 296-24-330 Flammable and combustible liquids.

[Order 73-5, 296-24-330, filed 5/9/73 and Order 73-4, 296-24-330, filed 5/7/73.]

WAC 296-24-33001 Definitions. The following definitions are applicable to all sections of this chapter which include WAC 296-24-330 in the section number.

- (1) **Aerosol** shall mean a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure.
- (2) **Atmospheric tank** shall mean a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g.
- (3) **Automotive service station** shall mean that portion of property where flammable or combustible liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles and shall include any facilities available for the sale and service of tires, batteries, and accessories, and for minor automotive maintenance work. Major automotive repairs, painting, body and fender work are excluded.
- (4) **Basement** shall mean a story of a building or structure having one-half or more of its height below ground level and to which access for fire fighting purposes is unduly restricted.
- (5) **Boiling point** shall mean the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this section the ten percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, may be used as the boiling point of the liquid.
- (6) **Boilover** shall mean the expulsion of crude oil (or certain other liquids) from a burning tank. The light fractions of the crude oil burnoff producing a heat wave in the residue, which on reaching a water strata may result in the expulsion of a portion of the contents of the tank in the form of froth.
- (7) **Bulk plant** shall mean that portion of a property where flammable or combustible liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle, or container.

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- (8) **Chemical plant** shall mean a large integrated plant or that portion of such a plant other than a refinery or distillery where flammable or combustible liquids are produced by chemical reactions or used in chemical reactions.
- (9) **Closed container** shall mean a container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.
- (10) **Crude petroleum** shall mean hydrocarbon mixtures that have a flash point below 150°F and which have not been processed in a refinery.
- (11) **Distillery** shall mean a plant or that portion of a plant where flammable or combustible liquids produced by fermentation are concentrated, and where the concentrated products may also be mixed, stored, or packaged.
- (12) **Fire area** shall mean an area of a building separated from the remainder of the building by construction having a fire resistance of at least one hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least one hour.
- (13) **Fire resistance or fire resistive construction** shall mean construction to resist the spread of fire.
- (14) **Flammable aerosol** shall mean an aerosol which is required to be labeled "Flammable" under the Federal Hazardous Substances Labeling Act (15 U.S.C. 1261). For the purposes of WAC 296-24-33009, such aerosols are considered Class IA liquids.
- (15) **"Flashpoint"** means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid, and shall be determined as follows:
 - (a) For a liquid which has a viscosity of less than 45 SUS at 100°F (37.8°C), does not contain suspended solids, and does not have a tendency to form a surface film while under test, the procedure specified in the Standard Method of Test for Flashpoint by Tag Closed Tester (ASTM D-56-70) shall be used.
 - (b) For a liquid which has a viscosity of 45 SUS or more at 100°F (37.8°C), or contains suspended solids, or has a tendency to form a surface film while under test, the Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester (ASTM D-93-71) shall be used, except that the methods specified in Note 1 to section 1.1 of ASTM D-93-71 may be used for the respective materials specified in the note.
 - (c) For a liquid that is a mixture of compounds that have different volatilities and flashpoints, its flashpoint shall be determined by using the procedure specified in (a) or (b) of this subsection on the liquid in the form it is shipped. If the flashpoint, as determined by this test, is 100°F (37.8°C) or higher, an additional flashpoint determination shall be run on a sample of the liquid evaporated to ninety percent of its original volume, and the lower value of the two tests shall be considered the flashpoint of the material.
 - (d) Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified in this section.
- (16) **Hotel** shall mean buildings or groups of buildings under the same management in which there are sleeping accommodations for hire primarily used by transients who are lodged with or without meals including but not limited to inns, clubs, motels, and apartment hotels.

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- (17) **Institutional occupancy** shall mean the occupancy or use of a building or structure or any portion thereof by persons harbored or detained to receive medical, charitable or other care or treatment, or by persons involuntarily detained.
- (18) **Liquid** shall mean, for the purpose of these standards, any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM Test for Penetration for Bituminous Materials, D-5-65. When not otherwise identified, the term liquid shall include both flammable and combustible liquids.
- (19) **“Combustible liquid”** means any liquid having a flashpoint at or above 100°F (37.8°C). Combustible liquids shall be divided into two classes as follows:
- (a) Class II liquids shall include those with flashpoints at or above 100°F (37.8°C) and below 140°F (60°C), except any mixture having components with flashpoints of 200°F (93.3°C) or higher, the volume of which make up ninety-nine percent or more of the total volume of the mixture.
 - (b) “Class III liquids” shall include those with flashpoints at or above 140°F (60°C). Class III liquids are subdivided into two subclasses:
 - (i) “Class IIIA liquids” shall include those with flashpoints at or above 140°F (60°C) and below 200°F (93.3°C) except any mixture having components with flashpoints of 200°F (93.3°C) or higher, the total volume of which make up ninety-nine percent or more of the total volume of the mixture.
 - (ii) “Class IIIB liquids” shall include those with flashpoints at or above 200°F (93.3°C). This section does not cover Class IIIB liquids. Where the term “Class III liquids” is used in this section, it shall mean only Class IIIA liquids.
 - (c) When a combustible liquid is heated for use to within 30°F (16.7°C) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.
- (20) **“Flammable liquid”** means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C), or higher, the total of which make up ninety-nine percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:
- (a) Class IA shall include liquids having flashpoints below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).
 - (b) Class IB shall include liquids having flashpoints below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).
 - (c) Class IC shall include liquids having flashpoints at or above 73°F (22.8°C) and below 100°F (37.8°C).
- (21) **Unstable (reactive) liquid** shall mean a liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.
- (22) **Low-pressure tank** shall mean a storage tank which has been designed to operate at pressures above 0.5 p.s.i.g. but not more than 15 p.s.i.g.

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- (23) **Marine service station** shall mean that portion of a property where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks or self-propelled craft, and shall include all facilities used in connection therewith.
- (24) **Mercantile occupancy** shall mean the occupancy or use of a building or structure or any portion thereof for the displaying, selling, or buying of goods, wares, or merchandise.
- (25) **Office occupancy** shall mean the occupancy or use of a building or structure or any portion thereof for the transaction of business, or the rendering or receiving of professional services.
- (26) **Portable tank** shall mean a closed container having a liquid capacity over sixty United States gallons and not intended for fixed installation.
- (27) **Pressure vessel** shall mean a storage tank or vessel which has been designed to operate at pressures above 15 p.s.i.g.
- (28) **Protection for exposure** shall mean adequate fire protection for structures on property adjacent to tanks, where there are employees of the establishment.
- (29) **Refinery** shall mean a plant in which flammable or combustible liquids are produced on a commercial scale from crude petroleum, natural gasoline, or other hydrocarbon sources.
- (30) **Safety can** shall mean an approved container, of not more than five gallons capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.
- (31) **Vapor pressure** shall mean the pressure, measured in pounds per square inch (absolute) exerted by a volatile liquid as determined by the "Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method)," American Society for Testing and Materials ASTM D323-68.
- (32) **Ventilation** as specified in these standards is for the prevention of fire and explosion. It is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.
- (33) **Storage:** Flammable or combustible liquids shall be stored in a tank or in a container that complies with WAC 296-24-33009(2).
- (34) **Barrel** shall mean a volume of forty-two United States gallons.
- (35) **Container** shall mean any can, barrel, or drum.
- (36) **Approved unless otherwise indicated, approved, or listed by a nationally recognized testing laboratory.** Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.
- (37) **Listed** see subsection (36) of this section.
- (38) **"SUS"** means Saybolt Universal Seconds as determined by the Standard Method of Test for Saybolt Viscosity (ASTM D-88-56), and may be determined by use of the SUS conversion tables specified in ASTM Method D2161-66 following determination of viscosity in accordance with the procedures specified in the Standard Method of Test for Viscosity of Transparent and Opaque Liquids (ASTM D445-65).

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- (39) “**Viscous**” means a viscosity of 45 SUS or more.

Note: The volatility of liquids is increased when artificially heated to temperatures equal to or higher than their flashpoints. When so heated Class II and III liquids shall be subject to the applicable requirements for Class I or II liquids. These standards may also be applied to high flashpoint liquids when so heated even though these same liquids when not heated are outside of its scope.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), 296-24-33001, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), 296-24-33001, filed 3/30/82. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-17-015 (Order 80-21), 296-24-33001, filed 11/13/80; Order 76-29, 296-24-33001, filed 9/30/76; Order 76-6, 296-24-33001, filed 3/1/76; Order 74-27, 296-24-33001, filed 5/7/74; Order 73-5, 296-24-33001, filed 5/9/73 and Order 73-4, 296-24-33001, filed 5/7/73.]

WAC 296-24-33003 Scope. This section applies to the handling, storage, and use of flammable and combustible liquids with a flash point below 200°F. This section does not apply to:

- (1) Bulk transportation of flammable and combustible liquids;
- (2) Storage, handling, and use of fuel oil tanks and containers connected with oil burning equipment;
- (3) Storage of flammable and combustible liquids on farms.
- (4) Liquids without flashpoints that may be flammable under some conditions, such as certain halogenated hydrocarbons and mixtures containing halogenated hydrocarbons;
- (5) Mists, sprays, or foams, except flammable aerosols covered in WAC 296-24-33009; or
- (6) Installations made in accordance with requirements of the following standards:
 - (a) National Fire Protection Association Standard for Drycleaning Plants, NFPA No. 32-1970;
 - (b) National Fire Protection Association Standard for the Manufacture of Organic Coatings, NFPA No. 35-1970;
 - (c) National Fire Protection Association Standard for Solvent Extraction Plants, NFPA No. 36-1967; or
 - (d) National Fire Protection Association Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA No. 37-1970.

[Statutory Authority: RCW 49.17.010, [49.17].050 and [49.17].060. 95-22-015, 296-24-33003, filed 10/20/95, effective 1/16/96. Statutory Authority: Chapter 49.17 RCW. 94-06-068 (Order 93-17), 296-24-33003, filed 3/2/94, effective 3/1/95; Order 73-5, 296-24-33003, filed 5/9/73 and Order 73-4, 296-24-33003, filed 5/7/73.]

WAC 296-24-33005 Tank storage.

- (1) Design and construction of tanks.
 - (a) Materials.
 - (i) Tanks shall be built of steel except as provided in (1)(a)(ii) through (v) of this section.
 - (ii) Tanks may be built of materials other than steel for installation underground or if required by the properties of the liquid stored. Tanks located above ground or inside buildings shall be of noncombustible construction.

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- (iii) Tanks built of materials other than steel shall be designed to specifications embodying principles recognized as good engineering design for the material used.
 - (iv) Unlined concrete tanks may be used for storing flammable or combustible liquids having a gravity of 40°API or heavier. Concrete tanks with special lining may be used for other services provided the design is in accordance with sound engineering practice.
 - (v) Tanks may have combustible or noncombustible linings.
 - (vi) Special engineering consideration shall be required if the specific gravity of the liquid to be stored exceeds that of water or if the tanks are designed to contain flammable or combustible liquids at a liquid temperature below 0°F.
- (b) Fabrication.
- (i) Tanks may be of any shape or type consistent with sound engineering design.
 - (ii) Metal tanks shall be welded, riveted, and caulked, brazed, or bolted, or constructed by use of a combination of these methods. Filler metal used in brazing shall be nonferrous metal or an alloy having a melting point above 1000°F and below that of the metal joined.
- (c) Atmospheric tanks.
- (i) Atmospheric tanks shall be built in accordance with acceptable good standards of design. Atmospheric tanks may be built in accordance with:
 - (A) Underwriters' Laboratories, Inc., Subjects No. 142, Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids, 1968; No. 58, Standards for Steel Underground Tanks for Flammable and combustible Liquids, Fifth Edition, December 1961; or No. 80, Standard for Steel Inside Tanks for Oil-Burner Fuel, September 1963.
 - (B) American Petroleum Institute Standards No. 650, Welded Steel Tanks for Oil Storage, Third Edition, 1966.
 - (C) American Petroleum Institute Standards No. 12B, Specification for Bolted Production Tanks, Eleventh Edition, May 1958, and Supplement 1, March 1962; No. 12D, Specification for Large Welded Production Tanks, Seventh Edition, August 1957; or No. 12F, Specification for Small Welded Production Tanks, Fifth Edition, March 1961. Tanks built in accordance with these standards shall be used only as production tanks for storage of crude petroleum in oil-producing areas.
 - (ii) Tanks designed for underground service not exceeding 2,500 gallons capacity may be used aboveground.
 - (iii) Low-pressure tanks and pressure vessels may be used as atmospheric tanks.
 - (iv) Atmospheric tanks shall not be used for the storage of a flammable or combustible liquid at a temperature at or above its boiling point.

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- (d) Low pressure tanks.
 - (i) The normal operating pressure of the tank shall not exceed the design pressure of the tank.
 - (ii) Low-pressure tanks shall be built in accordance with acceptable standards of design. Low-pressure tanks may be built in accordance with:
 - (A) American Petroleum Institute Standard No. 620, Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Third Edition, 1966.
 - (B) The principles of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessels Code, 1968.
 - (iii) Atmospheric tanks built according to the Underwriters' Laboratories, Inc., requirements in (1)(c)(i) of this section may be used for operating pressures not exceeding 1 p.s.i.g. and shall be limited to 2.5 p.s.i.g. under emergency venting conditions. Pressure vessels may be used as low-pressure tanks.
 - (e) Pressure vessels.
 - (i) The normal operating pressure of the vessel shall not exceed the design pressure of the vessel.
 - (ii) Pressure vessels shall be built in accordance with the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code, 1968.
 - (f) Provisions for internal corrosion. When tanks are not designed in accordance with the American Petroleum Institute, American Society of Mechanical Engineers, or the Underwriters' Laboratories, Inc.'s standards, or if corrosion is anticipated beyond that provided for in the design formulas used, additional metal thickness or suitable protective coatings or linings shall be provided to compensate for the corrosion loss expected during the design life of the tank.
- (2) Installation of outside aboveground tanks.
- (a) Location with respect to property lines and public ways.
 - (i) Every aboveground tank for the storage of flammable or combustible liquids, except those liquids with boil-over characteristics and unstable liquids, operating at pressures not in excess of 2.5 p.s.i.g. and equipped with emergency venting which will not permit pressures to exceed 2.5 p.s.i.g. shall be located in accordance with Table H-5.
 - (ii) Every aboveground tank for the storage of flammable or combustible liquids, except those liquids with boil-over characteristics and unstable flammable or combustible liquids, operating at pressures exceeding 2.5 p.s.i.g. or equipped with emergency venting which will permit pressures to exceed 2.5 p.s.i.g. shall be located in accordance with Table H-6.
 - (iii) Every aboveground tank for the storage of flammable or combustible liquids with boil-over characteristics shall be located in accordance with Table H-7.
 - (iv) Every aboveground tank for the storage of unstable liquids shall be located in accordance with Table H-8.

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- (v) Reference minimum distances for use in Tables H-5 to H-8 inclusive.
- (vi) Where end failure or horizontal pressure tanks and vessels may expose property, the tank shall be placed with the longitudinal axis parallel to the nearest important exposure.

TABLE H-5			
Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building and shall be not less than 5 feet
Floating roof	Protection for exposures.	1/2 times diameter of tank but need not exceed 90 ft.	1/6 times diameter of tank but need not exceed 30 ft.
	None	Diameter of tank but need not exceed 175 ft.	1/6 times diameter of tank but need not exceed 30 ft.
Vertical with weak roof to shell seam	Approved foam or inerting system on tank.	1/2 diameter of tank but need not exceed 90 ft. and shall not be less than 5 ft.	1/6 times diameter of tank but need not exceed 30 ft.
	Protection for exposures.	Diameter of tank but need not exceed 175 ft.	1/3 times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	1/3 times diameter of tank but need not exceed 60 ft.
Horizontal and vertical, with emergency relief venting to limit pressures to 2.5 p.s.i.g	Approved inerting system on the tank or approved foam system on vertical tanks.	1/2 times Table H-9 but shall not be less than 5 ft.	1/2 times Table H-9
	Protection for exposures.	Table H-9	Table H-9
	None	2 times table	Table H-9

TABLE H-6			
Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Any type	Protection for exposures.	1 1/2 times Table H-9 but shall not be less than 25 ft.	1 1/2 times Table H-9 but shall not be less than 25 ft.
	None	3 times Table H-9 but shall not be less than 50 ft.	1 1/2 times Table H-9 but shall not be less than 25 ft.

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TABLE H-7			
Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Floating roof	Protection for exposures.	Diameter of tank but need not exceed 175 ft.	1/3 times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	1/3 times diameter of tank but need not exceed 60 ft.
Fixed roof	Approved foam or inerting system.	Diameter of tank but need not exceed 175 ft.	1/3 times diameter of tank but need not exceed 60 ft.
	Protection for exposures.	2 times diameter of tank but need not exceed 350 ft.	2/3 times diameter of tank but need not exceed 60 ft.
	None	4 times diameter of tank but need not exceed 350 ft.	2/3 times diameter of tank but need not exceed 60 ft.

TABLE H-8			
Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Horizontal and vertical tanks with emergency relief venting to permit pressure not in excess of 2.5 p.s.i.g	Tank protected with any of the following: Approved water spray, approved inerting, approved insulation and refrigeration, approved barricade.	See Table H-9, but the distance may be not less than 25 ft.	Not less than 25 ft.
	Protection for exposures.	2 1/2 times Table H-9, but not less than 50 ft.	Not less than 50 ft.
	None	5 times Table H-9 but not less than 100 ft.	Not less than 100 ft.
Horizontal and vertical tanks with emergency relief venting to permit pressure over 2.5 p.s.i.g	Tank protected with any one of the following: Approved water spray, approved inerting, approved insulation and refrigeration, approved barricade.	2 times Table H-9 but not less than 50 ft.	Not less than 50 ft.
	Protection for exposures.	4 times table H-9 but not less than 100 ft.	Not less than 100 ft.
	None	8 times Table H-9 but not less than 150 ft.	Not less than 150 ft.

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TABLE H-9		
Capacity tank (gallons)	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

- (b) Spacing (shell-to-shell) between aboveground tanks.
- (i) The distance between any two flammable or combustible liquid storage tanks shall not be less than 3 feet.
 - (ii) Except as provided in (2)(b)(iii) of this section, the distance between any two adjacent tanks shall not be less than one-sixth the sum of their diameters. When the diameter of one tank is less than one-half the diameter of the adjacent tank, the distance between the two tanks shall not be less than one-half the diameter of the smaller tank.
 - (iii) Where crude petroleum in conjunction with production facilities are located in noncongested areas and have capacities not exceeding 126,000 gallons (3,000 barrels), the distance between such tanks shall not be less than 3 feet.
 - (iv) Where unstable flammable or combustible liquids are stored, the distance between such tanks shall not be less than one-half the sum of their diameters.
 - (v) When tanks are compacted in three or more rows or in an irregular pattern, greater spacing or other means shall be provided so that inside tanks are accessible for fire fighting purposes.
 - (vi) The minimum separation between a liquefied petroleum gas container and a flammable or combustible liquid storage tank shall be 20 feet, except in the case of flammable or combustible liquid tanks operating at pressures exceeding 2.5 p.s.i.g. or equipped with emergency venting which will permit pressures to exceed 2.5 p.s.i.g. in which case the provisions of (2)(b)(i) and (ii) of this section shall apply. Suitable means shall be taken to prevent the accumulation of flammable or combustible liquids under adjacent liquefied petroleum gas containers such as by diversion curbs or grading. When flammable or combustible liquid storage tanks are within a diked area, the liquefied petroleum gas containers shall be outside the diked area and at least 10 feet away from the centerline of the wall of the diked area. The foregoing provisions shall not apply when liquefied petroleum gas containers of 125 gallons or less capacity are installed adjacent to fuel oil supply tanks of 550 gallons or less capacity.

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- (c) Location of outside aboveground tanks with respect to important buildings on same property. Every outside aboveground tank shall be separated from important buildings on the same property by distances not less than those specified in (2)(a)(i), (ii), (iii) and (iv) of this section, whichever is applicable. The appropriate distance column in Tables H-5, H-6, H-7, H-8, or H-9, that shall be used shall be the one reading: "Minimum distance in feet from nearest side of any public way or from nearest important building."
 - (d) Normal venting for aboveground tanks.
 - (i) Atmospheric storage tanks shall be adequately vented to prevent the development of vacuum or pressure sufficient to distort the roof of a cone roof tank or exceed the design pressure in the case of other atmospheric tanks, as a result of filling or emptying, and atmospheric temperature changes.
 - (ii) Normal vents shall be sized either in accordance with: (A) The American Petroleum Institute Standard 2000 (1968), Venting Atmospheric and Low-Pressure Storage Tanks; or (B), other accepted standard; or (C) shall be at least as large as the filling or withdrawal connection, whichever is larger but in no case less than 1 1/4 inch nominal inside diameter.
 - (iii) Low-pressure tanks and pressure vessels shall be adequately vented to prevent development of pressure or vacuum, as a result of filling or emptying and atmospheric temperature changes, from exceeding the design pressure of the tank or vessel. Protection shall also be provided to prevent over-pressure from any pump discharging into the tank or vessel when the pump discharge pressure can exceed the design pressure of the tank or vessel.
 - (iv) If any tank or pressure vessel has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.
 - (v) Unless the vent is designed to limit the internal pressure 2.5 p.s.i. or less, the outlet of vents and vent drains shall be arranged to discharge in such a manner as to prevent localized overheating of any part of the tank in the event vapors from such vents are ignited.
 - (vi) Tanks and pressure vessels storing Class IA liquids shall be equipped with venting devices which shall be normally closed except when venting to pressures or vacuum conditions. Tanks and pressure vessels storing Class IB and IC liquids shall be equipped with venting devices which shall be normally closed except when venting under pressure or vacuum conditions, or with approved flame arresters.
- Exemption: Tanks of 3,000 bbls. capacity or less containing crude petroleum in crude-producing areas; and, outside aboveground atmospheric tanks under 1,000 gallons capacity containing other than Class IA flammable liquids may have open vents. (See (2)(f)(ii) of this section.)*
- (vii) Flame arresters or venting devices required in (2)(e)(vi) of this section may be omitted for Class IB and IC liquids where conditions are such that their use may, in case of obstruction, result in tank damage.
 - (e) Emergency relief venting for fire exposure for aboveground tanks.
 - (i) Every aboveground storage tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires.

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- (ii) In a vertical tank the construction referred to in (2)(e)(i) of this section may take the form of a floating roof, lifter roof, a weak roof-to-shell seam, or other approved pressure relieving construction. The weak roof-to-shell seam shall be constructed to fail preferential to any other seam.
- (iii) Where entire dependence for emergency relief is placed upon pressure relieving devices, the total venting capacity of both normal and emergency vents shall be enough to prevent rupture of the shell or bottom of the tank if vertical, or of the shell or heads if horizontal. If unstable liquids are stored, the effects of heat or gas resulting from polymerization, decomposition, condensation, or self-reactivity shall be taken into account. The total capacity of both normal and emergency venting devices shall be not less than that derived from Table H-10 except as provided in (2)(e)(v) and (vi) of this section. Such device may be a self-closing manhole cover, or one using long bolts that permit the cover to lift under internal pressure, or an additional or larger relief valve or valves. The wetted area of the tank shall be calculated on the basis of 55 percent of the total exposed area of a sphere or spheroid, 75 percent of the total exposed area of a horizontal tank and the first 30 feet above grade of the exposed shell area of a vertical tank.

TABLE 10 WETTED AREA VERSUS CUBIC FEET FREE AIR PER HOUR (14.7 psia and 60°F)					
Square Feet	CFH	Square Feet	CFH	Square Feet	CFH
20	21,100	200	211,000	1,000	524,000
30	31,600	250	239,000	1,200	557,000
40	42,100	300	265,000	1,400	587,000
50	52,700	350	288,000	1,600	614,000
60	63,200	400	312,000	1,800	639,000
70	73,700	500	354,000	2,000	662,000
80	84,200	600	392,000	2,400	704,000
90	94,800	700	428,000	2,800	742,000
100	105,000	800	462,000	and over	
120	126,000	900	493,000		
140	147,000	1,000	524,000		
160	168,000				
180	190,000				
200	211,000				

- (iv) For tanks and storage vessels designed for pressure over 1 p.s.i.g., the total rate of venting shall be determined in accordance with Table H-10, except that when the exposed wetted area of the surface is greater than 2,800 square feet, the total rate of venting shall be calculated by the following formula:

$$CFH = 1,107A^{0.82}$$

Where:

CFH = Venting requirement, in cubic feet of free air per hour.

A = Exposed wetted surface, in square feet.

Note: The foregoing formula is based on $Q = 21,000A^{0.82}$.

- (v) The total emergency relief venting capacity for any specific stable liquid may be determined by the following formula:

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$$\begin{aligned}\text{Cubic feet of free air per hour} &= V \\ V &= \frac{1337}{L M}\end{aligned}$$

V = Cubic feet of free air per hour from Table H-10.
L = Latent heat of vaporization of specific liquid in B.t.u. per pound.
M = Molecular weight of specific liquids.

- (vi) The required airflow rate of (2)(e)(iii) or (v) of this section may be multiplied by the appropriate factor listed in the following schedule when protection is provided as indicated. Only one factor may be used for any one tank.

0.5 for drainage in accordance with (2)(g)(ii) of this section for tanks over 200 square feet of wetted area.

0.3 for approved water spray.

0.3 for approved insulation.

0.15 for approved water spray with approved insulation.

- (vii) The outlet of all vents and vent drains on tanks equipped with emergency venting to permit pressures exceeding 2.5 p.s.i.g. shall be arranged to discharge in such a way as to prevent localized overheating of any part of the tank, in the event vapors from such vents are ignited.

- (viii) Each commercial tank venting device shall have stamped on it the opening pressure, the pressure at which the valve reaches the full open position, and the flow capacity at the latter pressure, expressed in cubic feet per hour of air at 60°F and at a pressure of 14.7 p.s.i.a.

- (ix) The flow capacity of tank venting devices 12 inches and smaller in nominal pipe size shall be determined by actual test of each type and size of vent. These flow tests may be conducted by the manufacturer if certified by a qualified impartial observer, or may be conducted by an outside agency. The flow capacity of tank venting devices larger than 12 inches nominal pipe size, including manhole covers with long bolts or equivalent, may be calculated provided that the opening pressure is actually measured, the rating pressure and corresponding free orifice area are stated, the word "calculated" appears on the nameplate, and the computation is based on a flow coefficient of 0.5 applied to the rated orifice area.

- (f) Vent piping for aboveground tanks.

- (i) Vent piping shall be constructed in accordance with WAC 296-24-33007 of this section.
- (ii) Where vent pipe outlets for tanks storing Class I liquids are adjacent to buildings or public ways, they shall be located so that the vapors are released at a safe point outside of buildings and not less than 12 feet above the adjacent ground level. In order to aid their dispersion, vapors shall be discharged upward or horizontally away from closely adjacent walls. Vent outlets shall be located so that flammable vapors will not be trapped by eaves or other obstructions and shall be at least five feet from building openings.
- (iii) When tank vent piping is manifolded, pipe sizes shall be such as to discharge within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are subject to the same fire exposure.

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- (g) Drainage, dikes, and walls for aboveground tanks.
 - (i) Drainage and diked areas. The area surrounding a tank or a group of tanks shall be provided with drainage as in (2)(g)(ii) of this section, or shall be diked as provided in (2)(g)(iii), to prevent accidental discharge of liquid from endangering adjoining property or reaching waterways.
 - (ii) Drainage. Where protection of adjoining property or waterways is by means of a natural or manmade drainage system, such systems shall comply with the following:
 - (A) A slope of not less than 1 percent away from the tank toward the drainage system shall be provided.
 - (B) The drainage system shall terminate in vacant land or other area or in an impounding basin having a capacity not smaller than that of the largest tank served. This termination area and the route of the drainage system shall be so located that, if the flammable or combustible liquids in the drainage system are ignited, the fire will not seriously expose tanks or adjoining property.
 - (C) The drainage system, including automatic drainage pumps, shall not discharge to adjoining property, natural water courses, public sewers, or public drains unless the discharge of flammable or combustible liquids would not constitute a hazard, or the system is so designed that it will not permit flammable or combustible liquids to be released.
 - (iii) Diked areas. Where protection of adjoining property or waterways is accomplished by retaining the liquid around the tank by means of a dike, the volume of the diked area shall comply with the following requirements:
 - (A) Except as provided in (2)(g)(iii)(B) of this section, the volumetric capacity of the diked area shall not be less than the greatest amount of liquid that can be released from the largest tank within the diked area, assuming a full tank. The capacity of the diked area enclosing more than one tank shall be calculated by deducting the volume of the tanks other than the largest tank below the height of the dike.
 - (B) For a tank or group of tanks with fixed roofs containing crude petroleum with boilover characteristics, the volumetric capacity of the diked area shall be not less than the capacity of the largest tank served by the enclosure, assuming a full tank. The capacity of the diked enclosure shall be calculated by deducting the volume below the height of the dike of all tanks within the enclosure.
 - (C) Walls of the diked area shall be of earth, steel, concrete or solid masonry designed to be liquidtight and to withstand a full hydrostatic head. Earthen walls 3 feet or more in height shall have a flat section at the top not less than 2 feet wide. The slope of an earthen wall shall be consistent with the angle of repose of the material of which the wall is constructed.
 - (D) The walls of the diked area shall be restricted to an average height of 6 feet above interior grade.

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- (E) Where provision is made for draining water from diked areas, drainage shall be provided at a uniform slope of not less than 1 percent away from tanks toward a sump, drainbox, or other safe means of disposal located at the greatest practical distance from the tank. Such drains shall normally be controlled in a manner so as to prevent flammable or combustible liquids from entering natural water courses, public sewers, or public drains, if their presence would constitute a hazard. Control of drainage shall be accessible under fire conditions.
- (F) No loose combustible material, empty or full drum or barrel, shall be permitted within the diked area.
- (G) Each diked area containing two or more tanks shall be subdivided preferably by drainage channels or at least by intermediate curbs in order to prevent spills from endangering adjacent tanks within the diked area as follows:
 - (I) When storing normally stable liquids in vertical cone roof tanks constructed with weak roof-to-shell seam or approved floating roof tanks or when storing crude petroleum in producing areas in any type of tank, one subdivision for each tank in excess of 10,000 bbls. and one subdivision for each group of tanks (no tank exceeding 10,000 bbls. capacity) having an aggregate capacity not exceeding 15,000 bbls.
 - (II) When storing normally stable flammable or combustible liquids in tanks not covered in (g)(iii)(G)(I) of this subsection, one subdivision for each tank in excess of 100,000 gallons (2,500 bbls.) and one subdivision for each group of tanks (no tank exceeding 100,000 gallons capacity) having an aggregate capacity not exceeding 150,000 gallons (3,570 bbls.).
 - (III) When storing unstable liquids in any type of tank, one subdivision for each tank except that tanks installed in accordance with the drainage requirements of NFPA 15-1969, Standard for Water Spray Fixed Systems for Fire Protection shall require no additional subdivision.
 - (IV) The drainage channels or intermediate curbs shall be located between tanks so as to take full advantage of the available space with due regard for the individual tank capacities. Intermediate curbs, where used, shall be not less than 18 inches in height.
- (h) Tank openings other than vents for aboveground tanks.
 - (i) Connections for all tank openings shall be vaportight and liquid tight. Vents are covered in (2)(d) through (f) of this section.
 - (ii) Each connection to an aboveground tank through which liquid can normally flow shall be provided with an internal or an external valve located as close as practical to the shell of the tank. Such valves, when external, and their connections to the tank shall be of steel except when the chemical characteristics of the liquid stored are incompatible with steel. When materials other than steel are necessary, they shall be suitable for the pressures, structural stresses, and temperatures involved, including fire exposures.
 - (iii) Each connection below the liquid level through which liquid does not normally flow shall be provided with a liquid tight closure. This may be a valve, plug, or blind, or a combination of these.

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- (iv) Openings for gaging shall be provided with a vapor tight cap or cover.
 - (v) For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity. A fill pipe entering the top of a tank shall terminate within 6 inches of the bottom of the tank and shall be installed to avoid excessive vibration.
 - (vi) Filling and emptying connections which are made and broken shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. Such connection shall be closed and liquidtight when not in use. The connection shall be properly identified.
- (3) Installation of underground tanks.
- (a) Location. Excavation for underground storage tanks shall be made with due care to avoid undermining of foundations of existing structures. Underground tanks or tanks under buildings shall be so located with respect to existing building foundations and supports that the loads carried by the latter cannot be transmitted to the tank. The distance from any part of a tank storing Class I liquids to the nearest wall of any basement or pit shall be not less than 1 foot, and to any property line that may be built upon, not less than 3 feet. The distance from any part of a tank storing Class II or Class III liquids to the nearest wall of any basement, pit or property line shall not be less than 1 foot.
 - (b) Depth and cover. Underground tanks shall be set on firm foundations and surrounded with at least 6 inches of noncorrosive, inert materials such as clean sand, earth, or gravel well tamped in place. The tank shall be placed in the hole with care since dropping or rolling the tank into the hole can break a weld, puncture or damage the tank, or scrape off the protective coating of coated tanks. Tanks shall be covered with a minimum of 2 feet of earth or shall be covered with not less than 1 foot of earth, on top of which shall be placed a slab of reinforced concrete not less than 4 inches thick. When underground tanks are, or are likely to be, subject to traffic, they shall be protected against damage from vehicles passing over them by at least 3 feet of earth cover, or 18 inches of well-tamped earth, plus 6 inches of reinforced concrete or 8 inches of asphaltic concrete. When asphaltic or reinforced concrete paving is used as part of the protection, it shall extend at least 1 foot horizontally beyond the outline of the tank in all directions.
 - (c) Corrosion protection. Corrosion protection for the tank and its piping shall be provided by one or more of the following methods:
 - (i) Use of protective coatings or wrappings;
 - (ii) Cathodic protection; or,
 - (iii) Corrosion resistant materials of construction.
 - (d) Vents.
 - (i) Location and arrangement of vents for Class I liquids. Vent pipes from tanks storing Class I liquids shall be so located that the discharge point is outside of buildings, higher than the fill pipe opening, and not less than 12 feet above the adjacent ground level. Vent pipes shall discharge only upward in order to disperse vapors. Vent pipes 2 inches or less in nominal inside diameter shall not be obstructed by devices that will cause excessive back pressure. Vent pipe outlets shall be so located that flammable vapors will not enter building openings, or be trapped under eaves or other obstructions. If the vent pipe is less than 10 feet in length, or greater than 2 inches in nominal inside diameter, the outlet shall be provided with a vacuum and pressure relief device or there shall be an approved flame arrester located in the vent line at the outlet or within the approved distance from the outlet.

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- (ii) Size of vents. Each tank shall be vented through piping adequate in size to prevent blow-back of vapor or liquid at the fill opening while the tank is being filled. Vent pipes shall be not less than 1 1/4 inch nominal inside diameter.

TABLE H-11 VENT LINE DIAMETERS			
Minimum flow GPM	Pipe Length*		
	50 feet	100 feet	200 feet
	Inches	Inches	Inches
100	1 1/4	1 1/4	1 1/4
200	1 1/4	1 1/4	1 1/4
300	1 1/4	1 1/4	1 1/2
400	1 1/4	1 1/2	2
500	1 1/2	1 1/2	2
600	1 1/2	2	2
700	2	2	2
800	2	2	3
900	2	2	3
1,000	2	2	3

* Vent lines of 50 ft., 100 ft., and 200 ft. of pipe plus 7 ells.

- (iii) Location and arrangement of vents for Class II or Class III liquids. Vent pipes from tanks storing Class II or Class III flammable liquids shall terminate outside of the building and higher than the fill pipe opening. Vent outlets shall be above normal snow level. They may be fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.
- (iv) Vent piping shall be constructed in accordance with WAC 296-24-33007. Vent pipes shall be so laid as to drain toward the tank without sags or traps in which liquid can collect. They shall be located so that they will not be subjected to physical damage. The tank end of the vent pipe shall enter the tank through the top.
- (v) When tank vent piping is manifolded, pipe sizes shall be such as to discharge, within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are filled simultaneously.
- (e) Tank openings other than vents.
- (i) Connections for all tank openings shall be vapor or liquid tight.
- (ii) Openings for manual gaging, if independent of the fill pipe, shall be provided with a liquid-tight cap or cover. If inside a building, each such opening shall be protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other approved device.
- (iii) Fill and discharge lines shall enter tanks only through the top. Fill lines shall be sloped toward the tank.
- (iv) For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.

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- (v) Filling and emptying connections which are made and broken shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. Such connection shall be closed and liquid-tight when not in use. The connection shall be properly identified.
- (4) Installation of tanks inside of buildings.
 - (a) Location. Tanks shall not be permitted inside of buildings except as provided in WAC 296-24-33011 and 296-24-33015 through 296-24-33019.
 - (b) Vents. Vents for tanks inside of buildings shall be as provided in (2)(d), (e), (f)(ii) and (3)(d) of this section, except that emergency venting by the use of weak roof seams on tanks shall not be permitted. Vents shall discharge vapors outside the buildings.
 - (c) Vent piping. Vent piping shall be constructed in accordance with WAC 296-24-33007.
 - (d) Tank openings other than vents.
 - (i) Connections for all tank openings shall be vapor or liquidtight. Vents are covered in (4)(b) of this section.
 - (ii) Each connection to a tank inside of buildings through which liquid can normally flow shall be provided with an internal or an external valve located as close as practical to the shell of the tank. Such valves, when external, and their connections to the tank shall be of steel except when the chemical characteristics of the liquid stored are incompatible with steel. When materials other than steel are necessary, they shall be suitable for the pressures, structural stresses, and temperatures involved, including fire exposures.
 - (iii) Flammable or combustible liquid tanks located inside of buildings, except in one-story buildings designed and protected for flammable or combustible liquid storage, shall be provided with an automatic-closing heat-actuated valve on each withdrawal connection below the liquid level, except for connections used for emergency disposal, to prevent continued flow in the event of fire in the vicinity of the tank. This function may be incorporated in the valve required in (4)(d)(ii) of this section, and if a separate valve, shall be located adjacent to the valve required in (4)(d)(ii) of this section.
 - (iv) Openings for manual gaging, if independent of the fill pipe (see (4)(d)(vi) of this section), shall be provided with a vaportight cap or cover. Each such opening shall be protected against liquid overflow and possible vapor release by means of a spring loaded check valve or other approved device.
 - (v) For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.
 - (vi) The fill pipe inside of the tank shall be installed to avoid excessive vibration of the pipe.
 - (vii) The inlet of the fill pipe shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. The inlet of the fill pipe shall be closed and liquidtight when not in use. The fill connection shall be properly identified.
 - (viii) Tanks inside buildings shall be equipped with a device, or other means shall be provided, to prevent overflow into the building.

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- (5) Supports, foundations, and anchorage for all tank locations.
- (a) General. Tank supports shall be installed on firm foundations. Tank supports shall be of concrete, masonry, or protected steel. Single wood timber supports (not cribbing) laid horizontally may be used for outside aboveground tanks if not more than 12 inches high at their lowest point.
 - (b) Fire resistance. Steel supports or exposed piling shall be protected by materials having a fire resistance rating of not less than 2 hours, except that steel saddles need not be protected if less than 12 inches high at their lowest point. Water spray protection or its equivalent may be used in lieu of fire-resistive materials to protect supports.
 - (c) Spheres. The design of the supporting structure for tanks such as spheres shall receive special engineering consideration.
 - (d) Load distribution. Every tank shall be so supported as to prevent the excessive concentration of loads on the supporting portion of the shell.
 - (e) Foundations. Tanks shall rest on the ground or on foundations made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.
 - (f) Flood areas. Where a tank is located in an area that may be subjected to flooding, the applicable precautions outlined in (5)(f) of this section shall be observed.
 - (i) No aboveground vertical storage tank containing a flammable or combustible liquid shall be located so that the allowable liquid level within the tank is below the established maximum flood stage, unless the tank is provided with a guiding structure such as described in (5)(f)(xiii), (xiv) and (xv) of this section.
 - (ii) Independent water supply facilities shall be provided at locations where there is no ample and dependable public water supply available for loading partially empty tanks with water.
 - (iii) In addition to the preceding requirements, each tank so located that more than 70 percent, but less than 100 percent, of its allowable liquid storage capacity will be submerged at the established maximum flood stage, shall be safeguarded by one of the following methods: Tank shall be raised, or its height shall be increased, until its top extends above the maximum flood stage a distance equivalent to 30 percent or more of its allowable liquid storage capacity: Provided, however, That the submerged part of the tank shall not exceed two and one-half times the diameter. Or, as an alternative to the foregoing, adequate noncombustible structural guides, designed to permit the tank to float vertically without loss of product, shall be provided.
 - (iv) Each horizontal tank so located that more than 70 percent of its storage capacity will be submerged at the established flood stage, shall be anchored, attached to a foundation of concrete or of steel and concrete, of sufficient weight to provide adequate load for the tank when filled with flammable or combustible liquid and submerged by flood waters to the established flood stage, or adequately secured by other means.
 - (v) Spherical and spheroidal tanks shall be protected by applicable methods as specified for either vertical or horizontal tanks.

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- (vi) At locations where there is no ample and dependable water supply, or where filling of underground tanks with liquid is impracticable because of the character of their contents, their use, or for other reasons, each tank shall be safeguarded against movement when empty and submerged by high ground water or flood waters by anchoring, weighting with concrete or other approved solid loading material, or securing by other means. Each such tank shall be so constructed and installed that it will safely resist external pressures due to high ground water or flood waters.
- (vii) At locations where there is an ample and dependable water supply available, underground tanks containing flammable or combustible liquids, so installed that more than 70 percent of their storage capacity will be submerged at the maximum flood stage, shall be so anchored, weighted, or secured by other means, as to prevent movement of such tanks when filled with flammable or combustible liquids, and submerged by flood waters to the established flood stage.
- (viii) Pipe connections below the allowable liquid level in a tank shall be provided with valves or cocks located as closely as practicable to the tank shell. Such valves and their connections to tanks shall be of steel or other material suitable for use with the liquid being stored. Cast iron shall not be used.
- (ix) At locations where an independent water supply is required, it shall be entirely independent of public power and water supply. Independent source of water shall be available when flood waters reach a level not less than 10 feet below the bottom of the lowest tank on a property.
- (x) The self-contained power and pumping unit shall be so located or so designed that pumping into tanks may be carried on continuously throughout the rise in flood waters from a level 10 feet below the lowest tank to the level of the potential flood stage.
- (xi) Capacity of the pumping unit shall be such that the rate of rise of water in all tanks shall be equivalent to the established potential average rate of rise of flood waters at any stage.
- (xii) Each independent pumping unit shall be tested periodically to insure that it is in satisfactory operating condition.
- (xiii) Structural guides for holding floating tanks above their foundations shall be so designed that there will be no resistance to the free rise of a tank, and shall be constructed of noncombustible material.
- (xiv) The strength of the structure shall be adequate to resist lateral movement of a tank subject to a horizontal force in any direction equivalent to not less than 25 pounds per square foot acting on the projected vertical cross-sectional area of the tank.
- (xv) Where tanks are situated on exposed points or bends in a shoreline where swift currents in flood waters will be present, the structures shall be designed to withstand a unit force of not less than 50 pounds per square foot.
- (xvi) The filling of a tank to be protected by water loading shall be started as soon as flood waters reach a dangerous flood stage. The rate of filling shall be at least equal to the rate of rise of the floodwaters (or the established average potential rate of rise).
- (xvii) Sufficient fuel to operate the water pumps shall be available at all times to insure adequate power to fill all tankage with water.

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- (xviii) All valves on connecting pipelines shall be closed and locked in closed position when water loading has been completed.
- (xix) Where structural guides are provided for the protection of floating tanks, all rigid connections between tanks and pipelines shall be disconnected and blanked off or binned before the floodwaters reach the bottom of the tank, unless control valves and their connections to the tank are of a type designed to prevent breakage between the valve and the tank shell.
- (xx) All valves attached to tanks other than those used in connection with water loading operations shall be closed and locked.
- (xxi) If a tank is equipped with a swing line, the swing pipe shall be raised to and secured at its highest position.
- (xxii) Inspections. The director or his/her designated representative shall make periodic inspections of all plants where the storage of flammable or combustible liquids is such as to require compliance with the foregoing requirements, in order to assure the following:
 - (A) That all flammable or combustible liquid storage tanks are in compliance with these requirements and so maintained.
 - (B) That detailed printed instructions of what to do in flood emergencies are properly posted.
 - (C) That station operators and other employees depended upon to carry out such instructions are thoroughly informed as to the location and operation of such valves and other equipment necessary to effect these requirements.
- (g) Earthquake areas. In areas subject to earthquakes, the tank supports and connections shall be designed to resist damage as a result of such shocks.
- (6) Sources of ignition. In locations where flammable vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling sources of ignition. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.
- (7) Testing.
 - (a) General. All tanks, whether shop built or field erected, shall be strength tested before they are placed in service in accordance with the applicable sections of the code under which they were built. The American Society of Mechanical Engineers (ASME) code stamp. American Petroleum Institute (API) monogram, or the label of the Underwriters' Laboratories, Inc., on a tank shall be evidence of compliance with this strength test. Tanks not marked in accordance with the above codes shall be strength tested before they are placed in service in accordance with good engineering principles and reference shall be made to the sections on testing in the codes listed in (l)(c)(i), (d)(ii) or (e)(ii) of this section.
 - (b) Strength. When the vertical length of the fill and vent pipes is such that when filled with liquid the static head imposed upon the bottom of the tank exceeds 10 pounds per square inch, the tank and related piping shall be tested hydrostatically to a pressure equal to the static head thus imposed.

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- (c) Tightness. In addition to the strength test called for in (7)(a) and (b), all tanks and connections shall be tested for tightness. Except for underground tanks, this tightness test shall be made at operating pressure with air, inert gas, or water prior to placing the tank in service. In the case of field-erected tanks the strength test may be considered to be the test for tank tightness. Underground tanks and piping, before being covered, enclosed, or placed in use, shall be tested for tightness hydrostatically, or with air pressure at not less than 3 pounds per square inch and not more than 5 pounds per square inch.
- (d) Repairs. All leaks or deformations shall be corrected in an acceptable manner before the tank is placed in service. Mechanical caulking is not permitted for correcting leaks in welded tanks except pinhole leaks in the roof.
- (e) Derated operations. Tanks to be operated at pressures below their design pressure may be tested by the applicable provisions of (7)(a) or (b) based upon the pressure developed under full emergency venting of the tank.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 06-05-027 (Order 05-45), § 296-24-33005, filed 02/07/06, effective 04/01/06. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-33005, filed 7/20/94, effective 9/20/94; 88-23-054 (Order 88-25), 296-24-33005, filed 11/14/88; Order 76-6, 296-24-33005, filed 3/1/76; Order 73-5, 296-24-33005, filed 5/9/73 and Order 73-4, 296-24-33005, filed 5/7/73.]

WAC 296-24-33007 Piping, valves, and fittings.

- (1) General.
 - (a) Design. The design (including selection of materials) fabrication, assembly, test, and inspection of piping systems containing flammable or combustible liquids shall be suitable for the expected working pressures and structural stresses. Conformity with the applicable provisions of Pressure Piping, ANSI B31-1967 series and the provisions of this section, shall be considered prima facie evidence of compliance with the foregoing provisions.
 - (b) Exceptions. This section does not apply to any of the following:
 - (i) Tubing or casing on any oil or gas wells and any piping connected directly thereto.
 - (ii) Motor vehicle, aircraft, boat, or portable or stationary engines.
 - (iii) Piping within the scope of any applicable boiler and pressures vessel code.
 - (c) Definitions. As used in this section, piping systems consist of pipe, tubing flanges, bolting, gaskets, valves, fittings, the pressure containing parts of other components such as expansion joints and strainers, and devices which serve such purposes as mixing, separating, snubbing, distributing, metering, or controlling flow.
- (2) Materials for piping, valves, and fittings.
 - (a) Required materials. Materials for piping, valves, or fittings shall be steel, nodular iron or malleable iron, except as provided in subsections (b), (c) and (d).
 - (b) Exceptions. Materials other than steel, nodular iron, or malleable iron may be used underground, or if required by the properties of the flammable or combustible liquid handled. Material other than steel, nodular iron, or malleable iron shall be designed to specifications embodying principles recognized as good engineering practices for the material used.
 - (c) Linings. Piping, valves, and fittings may have combustible or noncombustible linings.

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- (d) Low-melting materials. When low-melting point materials such as aluminum and brass or materials that soften on fire exposure such as plastics, or nonductile materials such as cast iron, are necessary, special consideration shall be given to their behavior on fire exposure. If such materials are used in aboveground piping systems or inside buildings, they shall be suitably protected against fire exposure or so located that any spill resulting from the failure of these materials could not unduly expose persons, important buildings or structures or can be readily controlled by remote valves.
- (3) Pipe joints. Joints shall be made liquid tight. Welded or screwed joints or approved connectors shall be used. Threaded joints and connections shall be made up tight with a suitable lubricant or piping compound. Pipe joints dependent upon the friction characteristics of combustible materials for mechanical continuity of piping shall not be used inside buildings. They may be used outside of buildings above or below ground. If used aboveground, the piping shall either be secured to prevent disengagement at the fitting or the piping system shall be so designed that any spill resulting from such disengagement could not unduly expose persons, important buildings or structures, and could be readily controlled by remote valves.
- (4) Supports. Piping systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion, or contraction.
- (5) Protection against corrosion. All piping for flammable or combustible liquids, both aboveground and underground, where subject to external corrosion, shall be painted or otherwise protected.
- (6) Valves. Piping systems shall contain a sufficient number of valves to operate the system properly and to protect the plant. Piping systems in connection with pumps shall contain a sufficient number of valves to control properly the flow of liquid in normal operation and in the event of physical damage. Each connection to pipelines, by which equipment such as tankcars or tank vehicles discharge liquids by means of pumps into storage tanks, shall be provided with a check valve for automatic protection against backflow if the piping arrangement is such that backflow from the system is possible.
- (7) Testing. All piping before being covered, enclosed, or placed in use shall be hydrostatically tested to 150 percent of the maximum anticipated pressure of the system, or pneumatically tested to 110 percent of the maximum anticipated pressure of the system, but not less than 5 pounds per square inch gage at the highest point of the system. This test shall be maintained for a sufficient time to complete visual inspection of all joints and connections, but for at least 10 minutes.

[Order 76-6, 296-24-33007, filed 3/1/76; Order 73-5, 296-24-33007, filed 5/9/73 and Order 73-4, 296-24-33007, filed 5/7/73.]

WAC 296-24-33009 Container and portable tank storage.

- (1) Scope.
 - (a) General. This section shall apply only to the storage of flammable or combustible liquids in drums or other containers (including flammable aerosols) not exceeding 60 gallons individual capacity and those portable tanks not exceeding 660 gallons individual capacity.
 - (b) Exceptions. This section shall not apply to the following:
 - (i) Storage of containers in bulk plants, service stations, refineries, chemical plants, and distilleries;
 - (ii) Class I or Class II liquids in the fuel tanks of a motor vehicle, aircraft, boat, or portable or stationary engine;
 - (iii) Flammable or combustible paints, oils, varnishes, and similar mixtures used for painting or maintenance when not kept for a period in excess of 30 days;

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- (iv) Beverages when packaged in individual containers not exceeding 1 gallon in size.
- (2) Design, construction, and capacity of containers.
 - (a) General. Only approved containers and portable tanks shall be used. Metal containers and portable tanks meeting the requirements of and containing products authorized by Chapter I, Title 49 of the Code of Federal Regulations - October 1, 1972, (regulations issued by the hazardous materials regulations board, department of transportation), shall be deemed to be acceptable.
 - (b) Emergency venting. Each portable tank shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 p.s.i.g., or 30 percent of the bursting pressure of the tank, whichever is greater. The total venting capacity shall be not less than that specified in WAC 296-24-33005 (2)(e)(iii) or (v). At least one pressure-actuated vent having a minimum capacity of 6,000 cubic feet of free air (14.7 p.s.i.a. and 60°F) shall be used. It shall be set to open at not less than 5 p.s.i.g. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300°F.

TABLE H-12 MAXIMUM ALLOWABLE SIZE OF CONTAINERS AND PORTABLE TANKS					
Flammable liquids			Combustible liquids		
Container Type	Class IA	Class IB	Class IC	Class II	Class III
Glass or approved plastic	1 pt.	1 qu.	1 gal.	1 gal.	1 gal.
Metal (other than DOT drums)	1 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Safety cans	2 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Metal drums (DOT spec.)	60 gal.	60 gal.	60 gal.	60 gal.	60 gal.
Approved portable tanks	660 gal.	660 gal.	660 gal.	660 gal.	660 gal.

Container exemptions:

- (i) Medicines, beverages, foodstuffs, cosmetics and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of (4)(a) and (b) of this section.
- (c) Size. Flammable and combustible liquid containers shall be in accordance with Table H-12, except that glass or plastic containers of no more than 1-gallon capacity may be used for a Class IA or IB flammable liquid if:
 - (i) Such liquid either would be rendered unfit for its intended use by contact with metal or would excessively corrode a metal container so as to create a leakage hazard; and
 - (ii) The user's process either would require more than 1 pint of Class IA liquid or more than 1 quart of a Class IB liquid of a single assay lot to be used at one time, or would require the maintenance of an analytical standard liquid of a quality which is not met by the specified standards of liquids available, and the quantity of the analytical standard liquid required to be used in any one control process exceeds one-sixteenth the capacity of the container allowed under Table H-12 for the class of liquid; or
 - (iii) The containers are intended for direct export outside the United States.

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- (3) Design, construction, and capacity of storage cabinets.
- (a) Maximum capacity. Not more than 60 gallons of Class I or Class II liquids, nor more than 120 gallons of Class III liquids may be stored in a storage cabinet.
 - (b) Fire resistance. Storage cabinets shall be designed and constructed to limit the internal temperature to not more than 325°F when subjected to a 10-minute fire test using the standard time-temperature curve as set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1969. All joints and seams shall remain tight and the door shall remain securely closed during the fire test. Cabinets shall be labeled "Flammable--Keep fire away."
 - (i) Metal cabinets constructed in the following manner shall be deemed to be in compliance. The bottom, top, door, and sides of cabinet shall be at least No. 18 gage sheet iron and double walled with 1 1/2-inch air space. Joints shall be riveted, welded or made tight by some equally effective means. The door shall be provided with a three-point lock, and the door sill shall be raised at least 2 inches above the bottom of the cabinet.
 - (ii) Wooden cabinets constructed in the following manner shall be deemed in compliance. The bottom, sides, and top shall be constructed of an approved grade of plywood at least 1 inch in thickness, which shall not break down or delaminate under fire conditions. All joints shall be rabbetted and shall be fastened in two directions with flathead woodscrews. When more than one door is used, there shall be a rabbetted overlap of not less than 1 inch. Hinges shall be mounted in such a manner as not to lose their holding capacity due to loosening or burning out of the screws when subjected to the fire test.
- (4) Design and construction of inside storage rooms.
- (a) Construction. Inside storage rooms shall be constructed to meet the required fire-resistive rating for their use. Such construction shall comply with the test specifications set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1969. Where an automatic sprinkler system is provided, the system shall be designed and installed in an acceptable manner. Openings to other rooms or buildings shall be provided with noncombustible liquid-tight raised sills or ramps at least 4 inches in height, or the floor in the storage area shall be at least 4 inches below the surrounding floor. Openings shall be provided with approved self-closing fire doors. The room shall be liquid tight where the walls join the floor. A permissible alternate to the sill or ramp is an open-grated trench inside of the room which drains to a safe location. Where other portions of the building or other properties are exposed, windows shall be protected as set forth in the Standard for Fire Doors and Windows, NFPA No. 80-1968, for Class E or F openings. Wood at least 1 inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar installations.
 - (b) Rating and capacity. Storage in inside storage rooms shall comply with Table H-13.

TABLE H-13 STORAGE IN INSIDE ROOMS			
Fire protection* provided	Fire resistance	Maximum size	Total allowable quantities (gals./sq. ft./floor area)
Yes	2 hours	500 sq. ft.	10
No	2 hours	500 sq. ft.	4
Yes	1 hour	150 sq. ft.	5
No	1 hour	150 sq. ft.	2

* Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

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- (c) Wiring. Electrical wiring and equipment within inside storage rooms used to store Class I liquids shall comply with the provisions of chapter 296-24 WAC Part L for Class I, Division 2 locations. For inside storage rooms used to store Class II and III liquids the pertinent provisions chapter 296-24 WAC Part L apply.
 - (d) Ventilation. Every inside storage room shall be provided with either a gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least six times per hour. If a mechanical exhaust system is used, it shall be controlled by a switch located outside of the door. The ventilating equipment and any lighting fixtures shall be operated by the same switch. A pilot light shall be installed adjacent to the switch if Class I flammable liquids are dispensed within the room. Where gravity ventilation is provided, the fresh air intake, as well as the exhaust outlet from the room, shall be on the exterior of the building in which the room is located.
 - (e) Storage in inside storage rooms. In every inside storage room there shall be maintained one clear aisle at least 3 feet wide. Containers over 30 gallons capacity shall not be stacked one upon the other. Dispensing shall be by approved pump or self-closing faucet only.
- (5) Storage inside building.
- (a) Egress. Flammable or combustible liquids, including stock for sale, shall not be stored so as to limit use of exits, stairways, or areas normally used for the safe egress of people.
 - (b) Containers. The storage of flammable or combustible liquids in containers or portable tanks shall comply with (4)(c) through (e) of this section.
 - (c) Office occupancies. Storage shall be prohibited except that which is required for maintenance and operation of building and operation of equipment. Such storage shall be kept in closed metal containers stored in a storage cabinet or in safety cans or in an inside storage room not having a door that opens into that portion of the building used by the public.
 - (d) Mercantile occupancies and other retail stores.
 - (i) In rooms or areas accessible to the public, storage shall be limited to quantities needed for display and normal merchandising purposes but shall not exceed 2 gallons per square foot of gross floor area. The gross floor area used for computing the maximum quantity permitted shall be considered as that portion of the store actually being used for merchandising flammable and combustible liquids.
 - (ii) Where the aggregate quantity of additional stock exceeds 60 gallons of Class IA, or 120 gallons of Class IB, or 180 gallons of Class IC, or 240 gallons of Class II, or 500 gallons of Class III liquids, or any combination of Class I and Class II liquids exceeding 240 gallons, it shall be stored in a room or portion of the building that complies with the construction provisions for an inside storage room as prescribed in (4) of this section. For water miscible liquids, these quantities may be doubled.
 - (iii) Containers in a display area shall not be stacked more than 3 feet or two containers high, whichever is the greater, unless the stacking is done on fixed shelving or is otherwise satisfactorily secured.
 - (iv) Shelving shall be of stable construction, of sufficient depth and arrangement such that containers displayed thereon shall not be easily displaced.

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- (v) Leaking containers shall be removed to a storage room or taken to a safe location outside the building and the contents transferred to an undamaged container.
- (e) General purpose public warehouses. Storage shall be in accordance with Table H-14 or H-15 and in buildings or in portions of such buildings cut off by standard firewalls. Material creating no fire exposure hazard to the flammable or combustible liquids may be stored in the same area.

**TABLE H-14
INDOOR CONTAINER STORAGE**

Class liquid	Storage level	Protected storage maximum per pile		Unprotected storage maximum per pile	
		Gal.	Ht.	Gal.	Ht.
IA	Ground and upper floors	2,750 (50)	3 ft. (1)	660 (12)	3 ft. (1)
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	5,500 (100)	6 ft. (2)	1,375 (25)	3 ft. (1)
	Basement	Not permitted		Not permitted	
IC	Ground and upper floors	16,500 (300)	6 ft. (2)	4,125 (75)	3 ft. (1)
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	16,500 (300)	9 ft. (3)	4,125 (75)	9 ft. (3)
	Basement	5,500 (100)	9 ft. (3)	Not permitted	
III	Ground and upper floors	55,000 (1,000)	15 ft. (5)	13,750 (250)	12 ft. (4)
	Basement	8,250 (450)	9 ft. (3)	Not permitted	

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

Note 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

(Numbers in parentheses indicate corresponding number of 55-gal. drums.)

Note 3: Each pile shall be separated from each other by at least 4 ft.

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**TABLE H-15
INDOOR PORTABLE TANK STORAGE**

Class liquid	Storage level	Protected storage maximum per pile		Unprotected storage maximum per pile	
		Gal.	Ht.	Gal.	Ht.
IA	Ground and upper floors	Not permitted		Not permitted	
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	20,000	7 ft.	2,000	7 ft.
	Basement	Not permitted		Not permitted	
IC	Ground and upper floors	40,000	14 ft.	5,500	7 ft.
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	40,000	14 ft.	5,500	7 ft.
	Basement	20,000	7 ft.	Not permitted	
III	Ground and upper floors	60,000	14 ft.	22,000	7 ft.
	Basement	20,000	7 ft.	Not permitted	

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

Note 2: Aisles shall be provided so that no portable tank is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

Note 3: Each pile shall be separated from each other by at least 4 ft.

- (f) Flammable and combustible liquid warehouses or storage buildings.
- (i) If the storage building is located 50 feet or less from a building or line of adjoining property that may be built upon, the exposing wall shall be a blank wall having a fire-resistance rating of at least 2 hours.
 - (ii) The total quantity of liquids within a building shall not be restricted, but the arrangement of storage shall comply with Table H-14 or H-15.
 - (iii) Containers in piles shall be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls.
 - (iv) Portable tanks stored over one tier high shall be designed to nest securely, without dunnage and adequate materials handling equipment shall be available to handle tanks safely at the upper tier level.
 - (v) No pile shall be closer than 3 feet to the nearest beam, chord, girder, or other obstruction, and shall be 3 feet below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems.

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- (vi) Aisles of at least 3 feet wide shall be provided where necessary for reasons of access to doors, windows or standpipe connections.
- (6) Storage outside buildings.
 - (a) General. Storage outside buildings shall be in accordance with Table H-16 or H-17, and (6)(b) and (d) of this section.

TABLE H-16 OUTDOOR CONTAINER STORAGE				
1 Class	2 Maximum per pile (see note 1)	3 Distance between piles (see note 2)	4 Distance to property line than can be built upon (see notes 3 & 4)	5 Distance to street, alley, public way, (see note 4)
	gal.	ft.	ft.	ft.
IA	1,100	5	20	10
IB	2,200	5	20	10
IC	4,400	5	20	10
II	8,800	5	10	5
III	22,000	5	10	5

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate gallonages.

Note 2: Within 200 ft. of each container, there shall be 12-ft. wide access way to permit approach of fire control apparatus.

Note 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

Note 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

- (b) Maximum storage. A maximum of 1,100 gallons of flammable or combustible liquids may be located adjacent to buildings located on the same premises and under the same management provided the provisions of (6)(b)(i) and (ii) are complied with.
 - (i) The building shall be a one-story building devoted principally to the handling and storing of flammable or combustible liquids or the building shall have 2 hour fire-resistive exterior walls having no opening within 10 feet of such storage.
 - (ii) Where quantity stored exceeds 1,100 gallons, or provisions of (6)(b)(i) cannot be met, a minimum distance of 10 feet between buildings and nearest container of flammable or combustible liquid shall be maintained.

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TABLE H-17 OUTDOOR PORTABLE TANK STORAGE				
1 Class	2 Maximum per pile (see note 1)	3 Distance between piles (see note 2)	4 Distance to property line than can be built upon (see notes 3 & 4)	5 Distance to street, alley, public way, (see note 4)
	gal.	ft.	ft.	ft.
IA	2,200	5	20	10
IB	4,400	5	20	10
IC	8,800	5	20	10
II	17,600	5	10	5
III	44,000	5	10	5

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate gallonages.

Note 2: Within 200 ft. of each portable tank, there shall be a 12-ft. wide access way to permit approach of fire control apparatus.

Note 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

Note 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

- (c) Spill containment. The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures or shall be surrounded by a curb at least 6 inches high. When curbs are used, provisions shall be made for draining of accumulations of ground or rain water or spills of flammable or combustible liquids. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions.
 - (d) Security. The storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible material not necessary to the storage.
- (7) Fire control.
- (a) Extinguishers. Suitable fire control devices, such as small hose or portable fire extinguishers, shall be available at locations where flammable or combustible liquids are stored.
 - (i) At least one portable fire extinguisher having a rating of not less than 12-B units shall be located outside of, but not more than 10 feet from, the door opening into any room used for storage.
 - (ii) At least one portable fire extinguisher having a rating of not less than 12-B units must be located not less than 10 feet, nor more than 25 feet, from any Class I or Class II liquid storage area located outside of a storage room but inside a building.

Note: For additional requirements relating to portable fire extinguishers see WAC 296-800-300.

- (b) Sprinklers. When sprinklers are provided, they shall be installed in accordance with chapter 296-24 WAC, Part G-3.

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- (c) Open flames and smoking. Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.
- (d) Water reactive materials. Materials which will react with water shall not be stored in the same room with flammable or combustible liquids.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 04-18.080 (Order 04-09), § 296-24-33009, filed 08/31/04, effective 11/01/04. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-33009, filed 7/20/94, effective 9/20/94; 91-24-017 (Order 91-07), 296-24-33009, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-33009, filed 4/19/85; Order 76-6, 296-24-33009, filed 3/1/76; Order 74-27, 296-24-33009, filed 5/7/74; Order 73-5, 296-24-33009, filed 5/9/73 and Order 73-4, 296-24-33009, filed 5/7/73.]

WAC 296-24-33011 Industrial plants.

- (1) Scope.
 - (a) Application. This section shall apply to those industrial plants where:
 - (i) The use of flammable or combustible liquids is incidental to the principal business, or
 - (ii) Where flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction. This section shall not apply to chemical plants, refineries or distilleries.
 - (b) Exceptions. Where portions of such plants involve chemical reactions such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes, those portions of the plant shall be in accordance with WAC 296-24-33017.
- (2) Incidental storage or use of flammable and combustible liquids.
 - (a) Application. This shall be applicable to those portions of an industrial plant where the use and handling of flammable or combustible liquids is only incidental to the principal business, such as automobile assembly, construction of electronic equipment, furniture manufacturing, or other similar activities.
 - (b) Containers. Flammable or combustible liquids shall be stored in tanks or closed containers.
 - (i) Except as provided in (b)(ii) and (iii) of this subsection all storage shall comply with WAC 296-24-33009 (3) or (4).
 - (A) When the only operation involved is the storage of flammables in containers or tanks that are closed and remain closed throughout the storage, WAC 296-24-33009(5) and tables H-14 and H-15 will apply.
 - (B) When the procedure involved is mixing, transferring, or other exposure of liquids to vaporization through operational procedures in which containers or tanks do not remain closed in the storage area, WAC 296-24-33009(4) and table H-13 shall be used to determine permissible quantities.
 - (ii) The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:
 - (A) Twenty-five gallons of Class IA liquids in containers.
 - (B) One hundred twenty gallons of Class IB, IC, II, or III liquids in containers.

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- (C) Six hundred sixty gallons of Class IB, IC, II, or III liquids in a single portable tank.
 - (iii) Where large quantities of flammable or combustible liquids are necessary, storage may be in tanks which shall comply with the applicable requirements of WAC 296-24-33005.
- (c) Separation and protection. Areas in which flammable or combustible liquids are transferred from one tank or container to another container shall be separated from other operations in the building by adequate distance or by construction having adequate fire resistance. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided.
- (d) Handling liquids at point of final use.
 - (i) Flammable liquids shall be kept in covered containers when not actually in use.
 - (ii) Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.
 - (iii) Class I liquids may be used only where there are no open flames or other sources of ignition within the possible path of vapor travel.
 - (iv) Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or portable tanks within a building only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container or portable tanks by gravity through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks shall be prohibited.
- (3) Unit physical operations.
 - (a) Application. This subsection (3) shall be applicable in those portions of industrial plants where flammable or combustible liquids are handled or used in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical change. Examples are plants compounding cosmetics, pharmaceuticals, solvents, cleaning fluids, insecticides, and similar types of activities.
 - (b) Location. Industrial plants shall be located so that each building or unit of equipment is accessible from at least one side for fire fighting and fire control purposes. Buildings shall be located with respect to lines of adjoining property which may be built upon as set forth in WAC 296-24-33017 (2)(a) and (b) except that the blank wall referred to in WAC 296-24-33017 (2)(b) shall have a fire resistance rating of at least two hours.
 - (c) Chemical processes. Areas where unstable liquids are handled or small scale unit chemical processes are carried on shall be separated from the remainder of the plant by a fire wall of two-hour minimum fire resistance rating.
 - (d) Drainage.
 - (i) Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire; see WAC 296-24-33005 (2)(g)(ii).

WAC 296-24-33011 (Cont.)

- (ii) Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators.
 - (iii) The industrial plant shall be designed and operated to prevent the normal discharge of flammable or combustible liquids into public waterways, public sewers, or adjoining property.
 - (e) Ventilation.
 - (i) Areas as defined in subsection (1)(a) of this section using Class I liquids shall be ventilated at a rate of not less than one cubic foot per minute per square foot of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building. Provision shall be made for introduction of makeup air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.
 - (ii) Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment, and to not more than five feet from equipment which exposes Class I liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.
 - (f) Storage and handling. The storage, transfer, and handling of liquid shall comply with WAC 296-24-33017(4).
- (4) Tank vehicle and tank car loading and unloading.
- Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property which may be built upon by a distance of twenty-five feet for Class I liquids and fifteen feet for Class II and Class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of WAC 296-24-33013(3).
- (5) Fire control.
- (a) Portable and special equipment. Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.
 - (b) Water supply. Water shall be available in volume and at adequate pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems as the need is indicated by the special hazards of operation, dispensing and storage.
 - (c) Special extinguishers. Special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical shall be provided as the need is indicated by the special hazards of operation dispensing and storage.
 - (d) Special hazards. Where the need is indicated by special hazards of operation, flammable or combustible liquid processing equipment, major piping, and supporting steel shall be protected by approved water spray systems, deluge systems, approved fire-resistant coatings, insulation, or any combination of these.

WAC 296-24-33011 (Cont.)

- (e) Maintenance. All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition, and they will serve their purpose in time of emergency.
- (6) Sources of ignition.
 - (a) General. Adequate precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.
 - (b) Grounding. Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of these standards shall be deemed to have been complied with.
- (7) Electrical.
 - (a) All electrical wiring and equipment shall be installed according to chapter 296-24 WAC Part L.
 - (b) Locations where flammable vapor-air mixtures may exist under normal operations shall be classified Class I, Division 1 according to the requirements of chapter 296-24 WAC Part L. For those pieces of equipment installed in accordance with the requirements of subsection (3)(e)(ii) of this section, the Division 1 area shall extend five feet in all directions from all points of vapor liberation. All areas within pits shall be classified Division 1 if any part of the pit is within a Division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.
 - (c) Locations where flammable vapor-air mixtures may exist under abnormal conditions and for a distance beyond Division 1 locations shall be classified Division 2 according to the requirements of chapter 296-24 WAC Part L. These locations include an area within twenty feet horizontally, three feet vertically beyond a Division 1 area, and up to three feet above floor or grade level within twenty-five feet, if indoors, or ten feet if outdoors, from any pump, bleeder, withdrawal fitting, meter, or similar device handling Class I liquids. Pits provided with adequate mechanical ventilation within a Division 1 or 2 area shall be classified Division 2. If Class II or Class III liquids only are handled, then ordinary electrical equipment is satisfactory though care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.
 - (d) Where the provisions of (a), (b), and (c) of this subsection require the installation of electrical equipment suitable for Class I, Division 1 or Division 2 locations, ordinary electrical equipment including switchgear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area. Ventilation makeup air shall be uncontaminated by flammable vapors.
- (8) Repairs to equipment. Hot work, such as welding or cutting operations, use of spark-producing power tools, and chipping operations shall be permitted only under supervision of an individual in responsible charge. The individual in responsible charge shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.

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- (9) Housekeeping.
- (a) General. Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up promptly.
 - (b) Access. Adequate aisles shall be maintained for unobstructed movement of personnel and so that fire protection equipment can be brought to bear on any part of flammable or combustible liquid storage, use, or any unit physical operation.
 - (c) Waste and residue. Combustible waste material and residues in a building or unit operating area shall be kept to a minimum, stored in covered metal receptacles and disposed of daily.
 - (d) Clear zone. Ground area around buildings and unit operating areas shall be kept free of weeds, trash, or other unnecessary combustible materials.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-33011, filed 7/20/94, effective 9/20/94; 91-24-017 (Order 91-07), 296-24-33011, filed 11/22/91, effective 12/24/91; 89-11-035 (Order 89-03), 296-24-33011, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-33011, filed 4/19/85; Order 76-6, 296-24-33011, filed 3/1/76; Order 73-5, 296-24-33011, filed 5/9/73 and Order 73-4, 296-24-33011, filed 5/7/73.]

WAC 296-24-33013 Bulk plants.

- (1) Storage.
- (a) Class I liquids. Class I liquids shall be stored in closed containers, or in storage tanks above ground outside of buildings, or underground in accordance with WAC 296-24-33005.
 - (b) Class II and III liquids. Class II and Class III liquids shall be stored in containers, or in tanks within buildings or above ground outside of buildings, or underground in accordance with WAC 296-24-33005.
 - (c) Piling containers. Containers of flammable or combustible liquids when piled one upon the other shall be separated by dunnage sufficient to provide stability and to prevent excessive stress on container walls. The height of the pile shall be consistent with the stability and strength of containers.
- (2) Buildings.
- (a) Exits. Rooms in which flammable or combustible liquids are stored or handled by pumps shall have exit facilities arranged to prevent occupants from being trapped in the event of fire.
 - (b) Heating. Rooms in which Class I liquids are stored or handled shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.
 - (c) Ventilation.
 - (i) Ventilation shall be provided for all rooms, buildings, or enclosures in which Class I liquids are pumped or dispensed. Design of ventilation systems shall take into account the relatively high specific gravity of the vapors. Ventilation may be provided by adequate openings in outside walls at floor level unobstructed except by louvers or course screens. Where natural ventilation is inadequate, mechanical ventilation shall be provided.

WAC 296-24-33013 (Cont.)

- (ii) Class I liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.
 - (iii) Containers of Class I liquids shall not be drawn from or filled within buildings unless provision is made to prevent the accumulation of flammable vapors in hazardous concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable liquids are being handled.
- (3) Loading and unloading facilities.
 - (a) Separation. Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property that may be built upon by a distance of 25 feet for Class I liquids and 15 feet for Class II and Class III liquids measured from the nearest position of any fill spout. Buildings for pumps or shelters for personnel may be a part of the facility.
 - (b) Class restriction. Equipment such as piping, pumps, and meters used for the transfer of Class I liquids between storage tanks and the fill stem of the loading rack shall not be used for the transfer of Class II or Class III liquids.
 - (c) Valves. Valves used for the final control for filling tank vehicles shall be of the self-closing type and manually held open except where automatic means are provided for shutting off the flow when the vehicle is full or after filling of a preset amount.
 - (d) Static protection.
 - (i) Bonding facilities for protection against static sparks during the loading of tank vehicles through open domes shall be provided:
 - (A) Where Class I liquids are loaded, or
 - (B) Where Class II or Class III liquids are loaded into vehicles which may contain vapors from previous cargoes of Class I liquids.
 - (ii) Protection as required in (3)(d)(i) of this section shall consist of a metallic bond wire permanently electrically connected to the fill stem or to some part of the rack structure in electrical contact with the fill stem. The free end of such wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle.
 - (iii) Such bonding connection shall be made fast to the vehicle or tank before dome covers are raised and shall remain in place until filling is completed and all dome covers have been closed and secured.
 - (iv) Bonding as specified in (3)(d)(i), (ii) and (iii) of this section is not required:
 - (A) Where vehicles are loaded exclusively with products not having a static accumulating tendency, such as asphalt, most crude oils, residual oils, and water soluble liquids;
 - (B) Where no Class I liquids are handled at the loading facility and the tank vehicles loaded are used exclusively for Class II and Class III liquids; and

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- (C) Where vehicles are loaded or unloaded through closed bottom or top connections.
 - (v) Filling through open domes into the tanks of tank vehicles or tank cars, that contain vapor-air mixtures within the flammable range or where the liquid being filled can form such a mixture, shall be by means of a downspout which extends near the bottom of the tank. This precaution is not required when loading liquids which are nonaccumulators of static charges.
 - (e) Stray currents. Tank car loading facilities where Class I liquids are loaded through open domes shall be protected against stray currents by bonding the pipe to at least one rail and to the rack structure if of metal. Multiple lines entering the rack area shall be electrically bonded together. In addition, in areas where excessive stray currents are known to exist, all pipe entering the rack area shall be provided with insulating sections to electrically isolate the rack piping from the pipelines. No bonding between the tank car and the rack or piping is required during either loading or unloading of Class II or III liquids.
 - (f) Container filling facilities. Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of these standards shall be deemed to have been complied with.
- (4) Wharves.
 - (a) Definition, application. The term wharf shall mean any wharf, pier, bulkhead, or other structure over or contiguous to navigable water used in conjunction with a bulk plant, the primary function of which is the transfer of flammable or combustible liquid cargo in bulk between the bulk plant and any tank vessel, ship, barge, lighter boat, or other mobile floating craft; and this subparagraph shall apply to all such installations except marine service stations as covered in WAC 296-24-33015.
 - (b) Package cargo. Package cargo of flammable and combustible liquids, including full and empty drums, bulk fuel, and stores may be handled over a wharf and at such times and places as may be agreed upon by the wharf superintendent and the senior deck officer on duty.
 - (c) Location. Wharves at which flammable or combustible liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be at least 100 feet from any bridge over a navigable waterway, or from an entrance to or superstructure of any vehicular or railroad tunnel under a waterway. The termination of the wharf loading or unloading fixed piping shall be at least 200 feet from a bridge or from an entrance to or superstructure of a tunnel.
 - (d) Design and construction. Substructure and deck shall be substantially designed for the use intended. Deck may employ any material which will afford the desired combination of flexibility, resistance to shock, durability, strength, and fire resistance. Heavy timber construction is acceptable.
 - (e) Tanks. Tanks used exclusively for ballast water or Class II or Class III liquids may be installed on suitably designed wharves.
 - (f) Pumps. Loading pumps capable of building up pressures in excess of the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves, or other arrangement to protect the loading facilities against excessive pressure. Relief devices shall be tested at not more than yearly intervals to determine that they function satisfactorily at the pressure at which they are set.

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- (g) Hoses and couplings. All pressure hoses and couplings shall be inspected at intervals appropriate to the service. The hose and couplings shall be tested with the hose extended and using the “inservice maximum operating pressures.” Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings shall be withdrawn from service and repaired or discarded.
- (h) Piping and fittings. Piping, valves, and fittings shall be in accordance with WAC 296-24-33007 with the following exceptions and additions:
 - (i) Flexibility of piping shall be assured by appropriate layout and arrangement of piping supports so that motion of the wharf structure resulting from wave action, currents, tides, or the mooring of vessels will not subject the pipe to repeated strain beyond the elastic limit.
 - (ii) Pipe joints depending upon the friction characteristics of combustible materials or grooving of pipe ends for mechanical continuity of piping shall not be used.
 - (iii) Swivel joints may be used in piping to which hoses are connected, and for articulated swivel-joint transfer systems, provided that the design is such that the mechanical strength of joint will not be impaired if the packing material should fail, as by exposure to fire.
 - (iv) Piping systems shall contain a sufficient number of valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage.
 - (v) In addition to the requirements of (4)(h)(iv), each line conveying flammable liquids leading to a wharf shall be provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area. Where more than one line is involved, the valves shall be grouped in one location.
 - (vi) Means of easy access shall be provided for cargo line valves located below the wharf deck.
 - (vii) Pipelines on flammable or combustible liquids wharves shall be adequately bonded and grounded. If excessive stray currents are encountered, insulating points shall be installed. Bonding and grounding connections on all pipelines shall be located on wharfside of hose-riser insulating flanges, if used, and shall be accessible for inspection.
 - (viii) Hose or articulated swivel-joint pipe connections used for cargo transfer shall be capable of accommodating the combined effects of change in draft and maximum tidal range, and mooring lines shall be kept adjusted to prevent the surge of the vessel from placing stress on the cargo transfer system.
 - (ix) Hose shall be supported so as to avoid kinking and damage from chafing.
- (i) Fire protection. Suitable portable fire extinguishers with a rating of not less than 12-BC shall be located with 75 feet of those portions of the facility where fires are likely to occur, such as hose connections, pumps, and separator tanks.
 - (i) Where piped water is available, ready-connected fire hose in size appropriate for the water supply shall be provided so that manifolds where connections are made and broken can be reached by at least one hose stream.
 - (ii) Material shall not be placed on wharves in such a manner as to obstruct access to fire fighting equipment, or important pipeline control valves.

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- (iii) Where the wharf is accessible to vehicle traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access of fire fighting apparatus.
 - (j) Operations control. Loading or discharging shall not commence until the wharf superintendent and officer in charge of the tank vessel agree that the tank vessel is properly moored and all connections are properly made. Mechanical work shall not be performed on the wharf during cargo transfer, except under special authorization by a delegated person or the delegated persons authorized representative based on a review of the area involved, methods to be employed, and precaution necessary.
- (5) Electrical equipment.
 - (a) Application. This subsection shall apply to areas where Class I liquids are stored or handled. For areas where Class II or Class III liquids only are stored or handled, the electrical equipment may be installed according to chapter 296-24 WAC Part L for ordinary locations.
 - (b) Conformance. All electrical equipment and wiring shall be of a type specified by and shall be installed according to chapter 296-24 WAC Part L.
 - (c) Classification. So far as it applies Table H-18 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. In Table H-18 a classified area shall not extend beyond an unpierced wall, roof, or other solid partition. The area classifications listed shall be based on the premise that the installation meets the applicable requirements of this section in all respects.

WAC 296-24-33013 (Cont.)

**TABLE H-18
ELECTRICAL EQUIPMENT HAZARDOUS
AREAS--BULK PLANTS**

Location	Class I Group D division	Extent of classified area
Tank vehicle and tank car: ¹		
Loading through open dome	1	Within 3 feet of edge of dome, extending in all directions.
	2	Area between 3 feet and 5 feet from edge of dome, extending in all directions.
Loading through bottom connections with atmospheric venting	1	Within 3 feet of point of venting to atmosphere, extending in all directions.
	2	Area between 3 feet and 5 feet from point of venting to atmosphere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection.
Loading through closed dome with atmospheric venting	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet from open end of vent, extending in all directions. Also within 3 feet of edge of dome, extending in all directions.
Loading through closed dome with vapor recovery	2	Within 3 feet of point of connection of both fill and vapor lines, extending in all directions.
Bottom loading with vapor recovery or any bottom unloading	2	Within 3 feet of point of connections extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection.
Drum and container filling: Outdoors, or indoors with Adequate ventilation	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Outdoors, or indoors with adequate ventilation	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Tank--Aboveground: Shell, ends, or roof and dike area	2	Within 10 feet from shell, ends, or roof of tank, area inside dikes to level of top of dike.

WAC 296-24-33013 (Cont.)

TABLE H-18
ELECTRICAL EQUIPMENT HAZARDOUS
AREAS--BULK PLANTS (Cont.)

Location	Class I Group D division	Extent of classified area
Vent	1	Within 5 feet of open end of vent, extending in all directions.
	2	Area between 5 feet and 10 feet from open end of vent, extending in all directions.
Floating roof	1	Area above the roof and within the shell.
Pits:		
Without mechanical ventilation	1	Entire area within pit if any part is within a Division 1 or 2 classified area.
With mechanical ventilation	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
Containing valves, fittings or piping, and not within a Division 1 or 2 classified area	2	Entire pit.
Pumps, bleeders, withdrawal fittings, meters and similar devices:		
Indoors	2	Within 5 feet of any edge of such devices, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of such devices.
Outdoors	2	Within 3 feet of any edge of such devices, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of such devices.
Storage and repair garage for tank vehicles	1	All pits or spaces below floor level.
	2	Area up to 18 inches above floor or grade level for entire storage or repair garage.
Drainage ditches, separators, impounding basins	2	Area up to 18 inches above ditch, separator or basin. Also up to 18 inches above grade within 15 feet horizontally from any edge.
Garages for other than tank Vehicles	Ordinary	If there is any opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor drum storage	Ordinary	
Indoor warehousing where there is no flammable liquid transfer	Ordinary	If there is any opening to these rooms within the extent of an indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.
Office and rest rooms	Ordinary	

¹ When classifying the extent of the area, consideration shall be given to the fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

- (6) Sources of ignition. Class I liquids shall not be handled, drawn, or dispensed where flammable vapors may reach a source of ignition. Smoking shall be prohibited except in designated localities. "No smoking" signs shall be conspicuously posted where hazard from flammable liquid vapors is normally present.

WAC 296-24-33013 (Cont.)

- (7) Drainage and waste disposal. Provision shall be made to prevent flammable or combustible liquids which may be spilled at loading or unloading points from entering public sewers and drainage systems, or natural waterways. Connection to such sewers, drains, or waterways by which flammable or combustible liquids might enter shall be provided with separator boxes or other approved means whereby such entry is precluded. Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.
- (8) Fire control. Suitable fire-control devices, such as small hose or portable fire extinguishers, shall be available to locations where fires are likely to occur. Additional fire-control equipment may be required where a tank of more than 50,000 gallons individual capacity contains Class I liquids and where an unusual exposure hazard exists from surrounding property. Such additional fire-control equipment shall be sufficient to extinguish a fire in the largest tank. The design and amount of such equipment shall be in accordance with approved engineering standards.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), 296-24-33013, filed 7/20/94, effective 9/20/94; 91-24-017 (Order 91-07), 296-24-33013, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-33013, filed 4/19/85; Order 76-6, 296-24-33013, filed 3/1/76; Order 73-5, 296-24-33013, filed 5/9/73 and Order 73-4, 296-24-33013, filed 5/7/73.]

WAC 296-24-33015 Service stations.

- (1) Storage and handling.
- (a) General provisions.
- (i) Liquids shall be stored in approved closed containers not exceeding 60 gallons capacity, in tanks located underground, in tanks in special enclosures as described in (b) of this subsection, or in aboveground tanks as provided for in (3)(b)(i), (ii), (iii) and (iv) of this section.
- (ii) Aboveground tanks, located in an adjoining bulk plant, may be connected by piping to service station underground tanks if, in addition to valves at aboveground tanks, a valve is also installed within control of service station personnel.
- (iii) Apparatus dispensing Class I liquids into the fuel tanks of motor vehicles of the public shall not be located at a bulk plant unless separated by a fence or similar barrier from the area in which bulk operations are conducted.
- (iv) The provisions of subsection (1) of this section shall not prohibit the dispensing of flammable liquids in the open from a tank vehicle to a motor vehicle. Such dispensing shall be permitted provided:
- (A) The tank vehicle complies with the requirements covered in the Standard on Tank Vehicles for Flammable Liquids, NFPA 385-1966.
- (B) The dispensing is done on premises not open to the public.
- (C) The dispensing hose does not exceed 50 feet in length.
- (D) The dispensing nozzle is a listed automatic-closing type without a latch-open device.

WAC 296-24-33015 (Cont.)

- (vi) Class I liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.
 - (vii) Accurate inventory records shall be maintained and reconciled on all Class I liquid storage tanks for possible indication of leakage from tanks or piping.
 - (b) Special enclosures.
 - (i) When installation of tanks in accordance with WAC 296-24-33005(3) is impractical because of property or building limitations, tanks for flammable or combustible liquids may be installed in buildings if properly enclosed.
 - (ii) The enclosure shall be substantially liquid and vaportight without backfill. Sides, top, and bottom of the enclosure shall be of reinforced concrete at least 6 inches thick, with openings for inspection through the top only. Tank connections shall be so piped or closed that neither vapors nor liquid can escape into the enclosed space. Means shall be provided whereby portable equipment may be employed to discharge to the outside any liquid or vapors which might accumulate should leakage occur.
 - (iii) At automotive service stations provided in connection with tenant or customer parking facilities at or below grade level in large buildings of commercial, mercantile, or residential occupancy, tanks containing Class I liquids, installed of necessity in accordance with subsection (1)(b)(ii) of this section, shall not exceed 6,000 gallons individual or 18,000 gallons aggregate capacity.
 - (c) Inside buildings.
 - (i) Except where stored in tanks as provided in subsection (1)(b) of this section, no Class I liquids shall be stored within any service station building except in closed containers of aggregate capacity not exceeding 60 gallons. One container not exceeding 60 gallons capacity equipped with an approved pump is permitted.
 - (ii) Class I liquids may be transferred from one container to another in lubrication or service rooms of a service station building provided the electrical installation complies with Table H-19 and provided that any heating equipment complies with subsection (5) of this section.
 - (iii) Class II and Class III liquids may be stored and dispensed inside service station buildings from tanks of not more than 120 gallons capacity each.
 - (d) Labeling. No sale or purchase of any Class I, II, or III liquids shall be made in containers unless such containers are clearly marked with the name of the product contained therein.
 - (e) Dispensing into portable containers. No delivery of any Class I liquids shall be made into portable containers unless the container is constructed of metal, has a tight closure with screwed or spring cover, and is fitted with a spout or so designed that the contents can be poured without spilling.
- (2) Dispensing systems.
- (a) Location. Dispensing devices at automotive service stations shall be so located that all parts of the vehicle being served will be on the premises of the service station.

WAC 296-24-33015 (Cont.)

- (b) Inside location. Approved dispensing units may be located inside of buildings. The dispensing area shall be separated from other areas in an approved manner. The dispensing unit and its piping shall be mounted either on a concrete island or protected against collision damage by suitable means and shall be located in a position where it cannot be struck by a vehicle descending a ramp or other slope out of control. The dispensing area shall be provided with an approved mechanical or gravity ventilation system. When dispensing units are located below grade, only approved mechanical ventilation shall be used and the entire dispensing area shall be protected by an approved automatic sprinkler system. Ventilating systems shall be electrically interlocked with gasoline dispensing units so that the dispensing units cannot be operated unless the ventilating fan motors are energized.
- (c) Emergency power cutoff. A clearly identified and easily accessible switch(es) or a circuit breaker(s) shall be provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency.
- (d) Dispensing units.
 - (i) Class I liquids shall be transferred from tanks by means of fixed pumps so designed and equipped as to allow control of the flow and to prevent leakage or accidental discharge.
 - (ii) Only listed devices may be used for dispensing Class I liquids. No such device may be used if it shows evidence of having been dismantled.
 - (iii) Every dispensing device for Class I liquids installed after December 31, 1978, shall contain evidence of listing so placed that any attempt to dismantle the device will result in damage to such evidence, visible without disassembly or dismounting of the nozzle.
 - (iv) Class I liquids shall not be dispensed by pressure from drums, barrels, and similar containers. Approved pumps taking suction through the top of the container or approved self-closing faucets shall be used.
 - (v) The dispensing units, except those attached to containers, shall be mounted either on a concrete island or protected against collision damage by suitable means.
- (e) Remote pumping systems.
 - (i) This subdivision shall apply to systems for dispensing Class I liquids where such liquids are transferred from storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.
 - (ii) Pumps shall be designed or equipped so that no part of the system will be subjected to pressures above its allowable working pressure. Pumps installed above grade, outside of buildings, shall be located not less than 10 feet from lines of adjoining property which is/or may be built upon, and not less than 5 feet from any building opening. When an outside pump location is impractical, pumps may be installed inside of buildings, as provided for dispensers in (b) of this subsection, or in pits as provided in (e)(iii) of this subsection. Pumps shall be substantially anchored and protected against physical damage by vehicles.
 - (iii) Pits for subsurface pumps or piping manifolds of submersible pumps shall withstand the external forces to which they may be subjected without damage to the pump, tank, or piping. The pit shall be no larger than necessary for inspection and maintenance and shall be provided with a fitted cover.

WAC 296-24-33015 (Cont.)

- (iv) A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket on the dispensing unit and the switch on this dispensing unit is manually actuated. This control shall also stop the pump when all nozzles have been returned to their brackets.
 - (v) An approved impact valve, incorporating a fusible link, designed to close automatically in the event of severe impact or fire exposure shall be properly installed in the dispensing supply line at the base of each individual dispensing device.
 - (vi) Testing. After the completion of the installation, including any paving, that section of the pressure piping system between the pump discharge and the connection for the dispensing facility shall be tested for at least 30 minutes at the maximum operating pressure of the system. Such tests shall be repeated at 5-year intervals thereafter.
 - (f) Delivery nozzles.
 - (i) A listed manual or automatic-closing type hose nozzle valve shall be provided on dispensers used for the dispensing of Class I liquids.
 - (ii) Manual-closing type valves shall be held open manually during dispensing. Automatic-closing type valves may be used in conjunction with an approved latch-open device.
 - (g) Special type dispensers.
 - (i) Emergency controls shall be installed at an acceptable location, but controls shall not be more than 100 feet from dispensers.
 - (ii) Instructions for the operation of dispensers shall be conspicuously posted.
- (3) Marine service stations.
 - (a) Dispensing.
 - (i) The dispensing area shall be located away from other structures so as to provide room for safe ingress and egress of craft to be fueled. Dispensing units shall in all cases be at least 20 feet from any activity involving fixed sources of ignition.
 - (ii) Dispensing shall be by approved dispensing units with or without integral pumps and may be located on open piers, wharves, or floating docks or on shore or on piers of the solid fill type.
 - (iii) Dispensing nozzles shall be automatic-closing without a hold-open latch.
 - (b) Tanks and pumps.
 - (i) Tanks, and pumps not integral with the dispensing unit, shall be on shore or on a pier of the solid fill type, except as provided below.
 - (ii) Where shore location would require excessively long supply lines to dispensers, tanks may be installed on a pier provided that applicable portions of WAC 296-24-33005 relative to spacing, diking, and piping are complied with and the quantity so stored does not exceed 1,100 gallons aggregate capacity.

WAC 296-24-33015 (Cont.)

- (iii) Shore tanks supplying marine service stations may be located above ground, where rock ledges or high water table make underground tanks impractical.
 - (iv) Where tanks are at an elevation which would produce gravity head on the dispensing unit, the tank outlet shall be equipped with a pressure control valve positioned adjacent to and outside the tank block valve specified in WAC 296-24-33005 (2)(h)(ii), so adjusted that liquid cannot flow by gravity from the tank in case of piping or hose failure.
 - (c) Piping.
 - (i) Piping between shore tanks and dispensing units shall be as described in WAC 296-24-33007, except that, where dispensing is from a floating structure, suitable lengths of oil-resistant flexible hose may be employed between the shore piping and the piping on the floating structure as made necessary by change in water level or shoreline.
 - (ii) A readily accessible valve to shut off the supply from shore shall be provided in each pipeline at or near the approach to the pier and at the shore end of each pipeline adjacent to the point where flexible hose is attached.
 - (iii) Piping shall be located so as to be protected from physical damage.
 - (iv) Piping handling Class I liquids shall be grounded to control stray currents.
- (4) Electrical equipment.
 - (a) Application. This subsection shall apply to areas where Class I liquids are stored or handled. For areas where Class II or Class III liquids are stored or handled the electrical equipment may be installed according to the provisions of chapter 296-24 WAC Part L for ordinary locations.
 - (b) All electrical equipment and wiring shall be of a type specified by and shall be installed according to chapter 296-24 WAC Part L.
 - (c) So far as it applies, Table H-19 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. A classified area shall not extend beyond an unpierced wall, roof, or other solid partition.
 - (d) The area classifications listed shall be based on the assumption that the installation meets the applicable requirements of this section in all respects.

WAC 296-24-33015 (Cont.)

TABLE H-19
ELECTRICAL EQUIPMENT HAZARDOUS
AREAS--SERVICE STATIONS

Location	Class I Group D division	Extent of classified area
Underground tank: Fill opening	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
	2	Up to 18 inches above grade level within a horizontal radius of 10 feet from a loose fill connection and within a horizontal radius of 5 feet from a tight fill connection.
Vent--Discharging upward directions.	1	Within 3 feet of open end of vent, extending in all
	2	Area between 3 feet and 5 feet of open end of vent, extending in all directions.
Dispenser: Pits	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
Dispenser enclosure	1	The area 4 feet vertically above base within the enclosure and 18 inches horizontally in all directions.
Outdoor	2	Up to 18 inches above grade level within 20 feet horizontally of any edge of enclosure.
Indoor: With mechanical Ventilation	2	Up to 18 inches above grade or floor level within 20 feet horizontally of any edge of enclosure.
With gravity ventilation	2	Up to 18 inches above grade or floor level within 25 feet horizontally of any edge of enclosure.
Remote pump--Outdoor	1	Any pit, box or space below grade level if any part is within a horizontal distance of 10 feet from any edge of pump.
	2	Within 3 feet of any edge of pump, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of pump.
Remote pump--Indoor	1	Entire area within any pit.
	2	Within 5 feet of any edge of pump, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of pump.
Lubrication or service	1	Entire area within any pit.
	2	Area up to 18 inches above floor or grade level within entire lubrication room.
Dispenser for Class I Liquids	2	Within 3 feet of any fill or dispensing point, extending in all directions.
Special enclosure inside building per WAC 296-24-33013 (1)(b) Sales, storage and rest Rooms	1	Entire enclosure.
	Ordinary	If there is any opening to these rooms within the extent of a Division 1 area, the entire room shall be classified as Division 1.

WAC 296-24-33015 (Cont.)

- (5) Heating equipment.
- (a) Conformance. Heating equipment shall be installed as provided in (b) through (e) of this subsection.
 - (b) Application. Heating equipment may be installed in the conventional manner in an area except as provided in (c), (d) or (e) of this subsection.
 - (c) Special room. Heating equipment may be installed in a special room separated from an area classified by Table H-19 by walls having a fire resistance rating of at least 1 hour and without any openings in the walls within 8 feet of the floor into an area classified in Table H-19. This room shall not be used for combustible storage and all air for combustion purposes shall come from outside the building.
 - (d) Work areas. Heating equipment using gas or oil fuel may be installed in the lubrication, sales, or service room where there is no dispensing or transferring of Class I liquids provided the bottom of the combustion chamber is at least 18 inches above the floor and the heating equipment is protected from physical damage by vehicles. Heating equipment using gas or oil fuel listed for use in garages may be installed in the lubrication or service room where Class I liquids are dispensed provided the equipment is installed at least 8 feet above the floor.
 - (e) Electric heat. Electrical heating equipment shall conform to subsection (4) of this section.
- (6) Drainage and waste disposal. Provision shall be made in the area where Class I liquids are dispensed to prevent spilled liquids from flowing into the interior of service station buildings. Such provision may be by grading driveways, raising door sills, or other equally effective means. Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers but shall be stored in tanks or drums outside of any building until removed from the premises.
- (7) Sources of ignition. In addition to the previous restrictions of this section, the following shall apply: There shall be no smoking or open flames in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids. Conspicuous and legible signs prohibiting smoking shall be posted within sight of the customer being served. The motors of all equipment being fueled shall be shut off during the fueling operation.
- (8) Fire control. Each service station shall be provided with at least one fire extinguisher having a minimum approved classification of 6 B, C located so that an extinguisher will be within 75 feet of each pump, dispenser, underground fill pipe opening, and lubrication or service room.

Note: For additional requirements relating to portable fire extinguishers see WAC 296-800-300.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-33015, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-33015, filed 4/19/85; 83-24-013 (Order 83-34), 296-24-33015, filed 11/30/83; Order 76-6, 296-24-33015, filed 3/1/76; Order 73-5, 296-24-33015, filed 5/9/73 and Order 73-4, 296-24-33015, filed 5/7/73.]

WAC 296-24-33017 Processing plants.

- (1) Scope. This section shall apply to those plants or buildings which contain chemical operations such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes but shall not apply to chemical plants, refineries or distilleries.

WAC 296-24-33017 (Cont.)

(2) Location.

- (a) Classification. The location of each processing vessel shall be based upon its flammable or combustible liquid capacity. Processing vessels shall be located, with respect to distances to lines of adjoining property which may be built upon, in accordance with Table H-20, except when the processing plant is designed in accordance with (2)(b) of this section.

TABLE H-20		
Processing vessels with emergency relief venting to permit pressure	Stable liquids	Unstable liquids
Not in excess of 2.5 p.s.i.g.	Table H-9	2 1/2 times Table H-9
Over 2.5 p.s.i.g.	1 1/2 times Table H-9	4 times Table H-9

- (b) Exception. The distances required in (2)(a) of this section may be waived when the vessels are housed within a building and the exterior wall facing the line of adjoining property which may be built upon is a blank wall having a fire-resistance rating of not less than 4 hours. When Class IA or unstable liquids are handled, the blank wall shall have explosion resistance in accordance with good engineering practice, see (3)(d) of this section.

(3) Processing building.

(a) Construction.

- (i) Processing buildings shall be of fire-resistance or noncombustible construction, except heavy timber construction with load-bearing walls may be permitted for plants utilizing only stable Class II or Class III liquids. Except as provided in (2)(b) of this section or in the case of explosion resistant walls used in conjunction with explosion relieving facilities, see (3)(d) of this section, loadbearing walls are prohibited. Buildings shall be without basements or covered pits.
- (ii) Areas shall have adequate exit facilities arranged to prevent occupants from being trapped in the event of fire. Exits shall not be exposed by the drainage facilities described in (3)(b) of this section.

(b) Drainage.

- (i) Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire, see WAC 296-24-33005 (2)(g)(ii).
- (ii) Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators.
- (iii) The processing plant shall be designed and operated to prevent the normal discharge of flammable or combustible liquids to public waterways, public sewers, or adjoining property.

WAC 296-24-33017 (Cont.)

- (c) Ventilation.
 - (i) Enclosed processing buildings shall be ventilated at a rate of not less than 1 cubic foot per minute per square foot of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building. Provision shall be made for introduction of makeup air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.
 - (ii) Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment, and to not more than 5 feet from equipment which exposes Class I liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.
- (d) Explosion relief. Areas where Class IA or unstable liquids are processed shall have explosion venting through one or more of the following methods:
 - (i) Open air construction.
 - (ii) Lightweight walls and roof.
 - (iii) Lightweight wall panels and roof hatches.
 - (iv) Windows of explosion venting type.
- (4) Liquid handling.
 - (a) Storage.
 - (i) The storage of flammable or combustible liquids in tanks shall be in accordance with the applicable provisions of WAC 296-24-33005.
 - (ii) If the storage of flammable or combustible liquids in outside aboveground or underground tanks is not practical because of temperature or production considerations, tanks may be permitted inside of buildings or structures in accordance with the applicable provisions of WAC 296-24-33005.
 - (iii) Storage tanks inside of buildings shall be permitted only in areas at or above grade which have adequate drainage and are separated from the processing area by construction having a fire resistance rating of at least 2 hours.
 - (iv) The storage of flammable or combustible liquids in containers shall be in accordance with the applicable provisions of WAC 296-24-33009.
 - (b) Piping, valves, and fittings.
 - (i) Piping, valves, and fittings shall be in accordance with WAC 296-24-33007.
 - (ii) Approved flexible connectors may be used where vibration exists or where frequent movement is necessary. Approved hose may be used at transfer stations.
 - (iii) Piping containing flammable or combustible liquids shall be identified.

WAC 296-24-33017 (Cont.)

- (c) Transfer.
 - (i) The transfer of large quantities of flammable or combustible liquids shall be through piping by means of pumps or water displacement. Except as required in process equipment, gravity flow shall not be used. The use of compressed air as a transferring medium is prohibited.
 - (ii) Positive displacement pumps shall be provided with pressure relief discharging back to the tank or to pump suction.
- (d) Equipment.
 - (i) Equipment shall be designed and arranged to prevent the unintentional escape of liquids and vapors and to minimize the quantity escaping in the event of accidental release.
 - (ii) Where the vapor space of equipment is usually within the flammable range, the probability of explosion damage to the equipment can be limited by inerting, by providing an explosion suppression system, or by designing the equipment to contain the peak explosion pressure which may be modified by explosion relief. Where the special hazards of operation, sources of ignition, or exposures indicate a need, consideration shall be given to providing protection by one or more of the above means.
- (5) Tank vehicle and tank car loading and unloading. Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings, or nearest line of adjoining property which may be built upon by a distance of 25 feet for Class I liquids and 15 feet for Class II and Class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of WAC 296-24-33013(3).
- (6) Fire control.
 - (a) Portable extinguishers. Approved portable fire extinguishers of appropriate size, type and number shall be provided.
 - (b) Other controls. Where the special hazards of operation or exposure indicate a need, the following fire control provision shall be provided.
 - (i) A reliable water supply shall be available in pressure and quantity adequate to meet the probable fire demands.
 - (ii) Hydrants shall be provided in accordance with accepted good practice.
 - (iii) Hose connected to a source of water shall be installed so that all vessels, pumps, and other equipment containing flammable or combustible liquids can be reached with at least one hose stream. Nozzles that are capable of discharging a water spray shall be provided.
 - (iv) Processing plants shall be protected by an approved automatic sprinkler system or equivalent extinguishing system. If special extinguishing systems including but not limited to those employing foam, carbon dioxide, or dry chemical are provided, approved equipment shall be used and installed in an approved manner.
 - (c) Alarm systems. An approved means for prompt notification of fire to those within the plant and any public fire department available shall be provided. It may be advisable to connect the plant system with the public system where public fire alarm system is available.

WAC 296-24-33017 (Cont.)

- (d) Maintenance. All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition and that they will serve their purpose in time of emergency.
- (7) Sources of ignition.
 - (a) General.
 - (i) Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, any mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.
 - (ii) Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.
 - (b) Maintenance and repair.
 - (i) When necessary to do maintenance work in a flammable or combustible liquid processing area, the work shall be authorized by a responsible representative of the employer.
 - (ii) Hot work such as welding or cutting operations, use of spark-producing power tools, and chipping operations shall be permitted only under supervision of an individual in responsible charge who shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.
 - (c) Electrical.
 - (i) All electrical wiring and equipment within storage or processing areas shall be installed according to chapter 296-24 WAC Part L.
 - (ii) Locations where flammable vapor-air mixtures may exist under normal operations shall be classified Class I, Division 1 according to the requirements of chapter 296-24 WAC Part L. For those pieces of equipment installed in accordance with (3)(c)(ii) of this section, the Division 1 area shall extend 5 feet in all directions from all points of vapor liberation. All areas within pits shall be classified Division 1 if any part of the pit is within a Division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.
 - (iii) Locations where flammable vapor-air mixtures may exist under abnormal conditions and for a distance beyond Division 1 locations shall be classified Division 2 according to the requirements of chapter 296-24 WAC Part L. These locations include an area within 20 feet horizontally, 3 feet vertically beyond a Division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pump, bleeder, withdrawal fittings, meter, or similar device handling Class I liquids. Pits provided with adequate mechanical ventilation within a Division 1 or 2 area shall be classified Division 2. If Class II or Class III liquids only are handled, then ordinary electrical equipment is satisfactory though care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.

WAC 296-24-33017 (Cont.)

- (iv) Where the provisions of (7)(c)(i), (ii), and (iii) of this section require the installation of explosion-proof equipment, ordinary electrical equipment including switchgear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area. Ventilation makeup air shall be uncontaminated by flammable vapors.
- (8) Housekeeping.
 - (a) General. Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up promptly.
 - (b) Access. Adequate aisles shall be maintained for unobstructed movement of personnel and so that fire protection equipment can be brought to bear on any part of the processing equipment.
 - (c) Waste and residues. Combustible waste material and residues in a building or operating area shall be kept to a minimum, stored in closed metal waste cans, and disposed of daily.
 - (d) Clear zone. Ground area around buildings and operating areas shall be kept free of tall grass, weeds, trash, or other combustible materials.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-33017, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-33017, filed 4/19/85; Order 76-6, 296-24-33017, filed 3/1/76; Order 73-5, 296-24-33017, filed 5/9/73 and Order 73-4, 296-24-33017, filed 5/7/73.]

WAC 296-24-33019 Refineries, chemical plants, and distilleries.

- (1) Storage tanks. Flammable or combustible liquids shall be stored in tanks, in containers, or in portable tanks. Tanks shall be installed in accordance with WAC 296-24-33005. Tanks for the storage of flammable or combustible liquids in tank farms and in locations other than process areas shall be located in accordance with WAC 296-24-33005 (2)(a) and (b).
- (2) Wharves. Wharves handling flammable or combustible liquids shall be in accordance with WAC 296-24-33013(4).
- (3) Fired and unfired pressure vessels.
 - (a) Fired vessels. Fired pressure vessels shall be constructed in accordance with the Code for Fired Pressure Vessels, section I of the ASME Boiler and Pressure Vessel Code--1968.
 - (b) Unfired vessels shall be constructed in accordance with the Code for Unfired Pressure Vessels, section VIII of the ASME Boiler and Pressure Vessel Code--1968.
- (4) Location of process units. Process units shall be located so that they are accessible from at least one side for the purpose of fire control. Where topographical conditions are such that flammable or combustible liquids may flow from a processing area so as to constitute a fire hazard to property of others, provision shall be made to divert or impound the flow by curbs, drains, or other suitable means.
- (5) Fire control.
 - (a) Portable equipment. Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

WAC 296-24-33019 (Cont.)

- (b) **Water supply.** Water shall be available in volume and at adequate pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems as the need is indicated by the special hazards of operation and storage.
- (c) **Special equipment.** Special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical shall be provided as the need is indicated by the special hazards of operation and storage.

[Order 73-5, 296-24-33019, filed 5/9/73 and Order 73-4, 296-24-33019, filed 5/7/73.]

WAC 296-24-370 Spray finishing using flammable and combustible materials.

[Order 73-5, 296-24-370, filed 5/9/73 and Order 73-4, 296-24-370, filed 5/7/73.]

WAC 296-24-37001 Definitions.

- (1) **Aerated solid powders.** Aerated powders shall mean any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below. It is common practice to fluidize such materials to form a fluidized powder bed and then dip the part to be coated into the bed in a manner similar to that used in liquid dipping. Such beds are also used as sources for powder spray operations.
- (2) **Spraying area.** Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes.
- (3) **Spray booth.** A power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system.
- (4) **Waterwash spray booth.** A spray booth equipped with a water washing system designed to minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material.
- (5) **Dry spray booth.** A spray booth not equipped with a water washing system as described in subsection (4) of this section. A dry spray booth may be equipped with (a) distribution or baffle plates to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct; or (b) overspray dry filters to minimize dusts; or (c) overspray dry filters to minimize dusts or residues entering exhaust ducts; or (d) overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts; or (e) where dry powders are being sprayed, with powder collection systems so arranged in the exhaust to capture oversprayed material.
- (6) **Fluidized bed.** A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.
- (7) **Electrostatic fluidized bed.** A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported through the container immediately above the charged and aerated materials in order to be coated.
- (8) **Approved.** Shall mean approved and listed by a nationally recognized testing laboratory. Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.
- (9) **Listed.** See “approved” in subsection (8) of this section.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), 296-24-37001, filed 11/14/88; Order 76-6, 296-24-37001, filed 3/1/76; Order 73-5, 296-24-37001, filed 5/9/73 and Order 73-4, 296-24-37001, filed 5/7/73.]

WAC 296-24-37003 Spray booths.

- (1) Construction. Spray booths shall be substantially constructed of steel, securely and rigidly supported, or of concrete or masonry except that aluminum or other substantial noncombustible material may be used for intermittent or low volume spraying. Spray booths shall be designed to sweep air currents toward the exhaust outlet.
- (2) Interiors. The interior surfaces of spray booths shall be smooth and continuous without edges and otherwise designed to prevent pocketing of residues and facilitate cleaning and washing without injury.
- (3) Floors. The floor surface of a spray booth and operator's working area, if combustible, shall be covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues.
- (4) Distribution or baffle plates. Distribution or baffle plates, if installed to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct, shall be of noncombustible material and readily removable or accessible on both sides for cleaning. Such plates shall not be located in exhaust ducts.
- (5) Dry type overspray collectors--(Exhaust air filters). In conventional dry type spray booths, overspray dry filters or filter rolls, if installed, shall conform to the following:
 - (a) The spraying operations except electrostatic spraying operations shall be so designed, installed and maintained that the average air velocity over the open face of the booth (or booth cross section during spraying operations) shall be not less than 100 linear feet per minute. Electrostatic spraying operations may be conducted with an air velocity over the open face of the booth of not less than 60 linear feet per minute, or more, depending on the volume of the finishing material being applied and its flammability and explosion characteristics. Visible gauges or audible alarm or pressure activated devices shall be installed to indicate or insure that the required air velocity is maintained. Dry spray booths equipped with a filter roll which is automatically advanced when the air velocity is reduced to that specified in this section should be arranged to cause shutdown of spraying operations if the filter roll fails to advance automatically. Maintenance procedures should be established to assure replacing filter pads before excessive restriction to airflow occurs. Filter pads should be inspected after each period of use and clogged filter pads discarded and replaced. Filter rolls shall be inspected to insure proper replacement of filter media.
 - (b) All discarded filter pads and filter rolls shall be immediately removed to a safe, well-detached location or placed in a water-filled metal container and disposed of at the close of the day's operation unless maintained completely in water.
 - (c) The location of filters in a spray booth shall be so as to not reduce the effective booth enclosure of the articles being sprayed.
 - (d) Space within the spray booth on the downstream and upstream sides of filters shall be protected with an approved automatic sprinkler system meeting one of the following requirements:
 - (i) An automatic sprinkler system as defined in WAC 296-24-607; or
 - (ii) A fixed dry chemical extinguishing system as defined in WAC 296-24-622; or
 - (iii) A fixed carbon dioxide gaseous agent system as defined in WAC 296-24-623.
 - (e) Filters or filter rolls shall not be used when applying a spray material known to be highly susceptible to spontaneous heating and ignition.

WAC 296-24-37003 (Cont.)

- (f) Clean filters or filter rolls shall be noncombustible or of a type having a combustibility not in excess of Class 2 filters as listed by Underwriters' Laboratories, Inc. Filters and filter rolls shall not be alternately used for different types of coating materials, where the combination of materials may be conducive to spontaneous ignition. See also WAC 296-24-37013(6).
- (6) Frontal area. Each spray booth having a frontal area larger than 9 square feet shall have a metal deflector or curtain not less than 2 1/2 inches deep installed at the upper outer edge of the booth over the opening.
- (7) Conveyors. Where conveyors are arranged to carry work into or out of spray booths, the openings therefor shall be as small as practical.
- (8) Separation of operations. Each spray booth shall be separated from other operations by not less than 3 feet, or by a greater distance, or by such partition or wall as to reduce the danger from juxtaposition of hazardous operations. See also WAC 296-24-37005(1).
- (9) Cleaning. Spray booths shall be so installed that all portions are readily accessible for cleaning. A clear space of not less than 3 feet on all sides shall be kept free from storage or combustible construction.
- (10) Illumination. When spraying areas are illuminated through glass panels or other transparent materials, only fixed lighting units shall be used as a source of illumination. Panels shall effectively isolate the spraying area from the area in which the lighting unit is located, and shall be of a noncombustible material of such a nature or so protected that breakage will be unlikely. Panels shall be so arranged that normal accumulations of residue on the exposed surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), 296-24-37003, filed 5/15/89, effective 6/30/89; Order 76-6, 296-24-37003, filed 3/1/76; Order 73-5, 296-24-37003, filed 5/9/73 and Order 73-4, 296-24-37003, filed 5/7/73.]

WAC 296-24-37005 Electrical and other sources of ignition.

- (1) Conformance. All electrical equipment, open flames and other sources of ignition shall conform to the requirements of this section, except as follows:
 - (a) Electrostatic apparatus shall conform to the requirements of WAC 296-24-37015 and 296-24-37017.
 - (b) Drying, curing, and fusion apparatus shall conform to the requirements of WAC 296-24-37019.
 - (c) Automobile undercoating spray operations in garages shall conform to the requirements of WAC 296-24-37021.
 - (d) Powder coating equipment shall conform to the requirements of WAC 296-24-37023.
- (2) Minimum separation. There shall be no open flame or spark producing equipment in any spraying area nor within 20 feet thereof, unless separated by a partition.
- (3) Hot surfaces. Space-heating appliances, steam pipes, or hot surfaces shall not be located in a spraying area where deposits of combustible residues may readily accumulate.
- (4) Wiring conformance. Electrical wiring and equipment shall conform to the provisions of this section and chapter 296-24 WAC Part L.

WAC 296-24-37005 (Cont.)

- (5) Combustible residues, areas. Unless specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors, there shall be no electrical equipment in any spraying area, whereon deposits of combustible residues may readily accumulate, except wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.
- (6) Wiring type approved. Electrical wiring and equipment not subject to deposits of combustible residues but located in a spraying area as herein defined shall be of explosion-proof type approved for Class I, Group D locations and conform to the provisions of chapter 296-24 WAC Part L, for Class I, Division 1, hazardous locations. Electrical wiring, motors, and other equipment outside of but within twenty feet of any spraying area, and not separated therefrom by partitions, shall not produce sparks under normal operating conditions and conform to the provisions of chapter 296-24 WAC Part L for Class I, Division 2, hazardous locations.
- (7) Lamps. Electric lamps outside of, but within twenty feet of any spraying area, and not separated therefrom by a partition, shall be totally enclosed to prevent the falling of hot particles and shall be protected from mechanical injury by suitable guards or by location.
- (8) Portable lamps. Portable electric lamps shall not be used in any spraying area during spraying operations. Portable electric lamps, if used during cleaning or repairing operations, shall be of the type approved for hazardous Class I locations.
- (9) Grounding.
 - (a) All metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids shall be properly electrically grounded in an effective and permanent manner.
 - (b) "Airless" high-fluid pressure spray guns and any conductive object being sprayed should be properly electrically grounded.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-37005, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-37005, filed 4/19/85; Order 76-6, 296-24-37005, filed 3/1/76; Order 73-5, 296-24-37005, filed 5/9/73 and Order 73-4, 296-24-37005, filed 5/7/73.]

WAC 296-24-37007 Ventilation.

- (1) Conformance. Ventilating and exhaust systems shall be in accordance with the Standard for Blower and Exhaust Systems for Vapor Removal, NFPA No. 91-1961, where applicable and shall also conform to the provisions of this section.
- (2) General. All spraying areas shall be provided with mechanical ventilation adequate to remove flammable vapors, mists or powders to a safe location and to confine and control combustible residues so that life is not endangered. Mechanical ventilation shall be kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted.
- (3) Independent exhaust. Each spray booth shall have an independent exhaust duct system discharging to the exterior of the building, except that multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 square feet may have a common exhaust. If more than one fan serves one booth, all fans shall be so interconnected that one fan cannot operate without all fans being operated.

WAC 296-24-37007 (Cont.)

- (4) Fan-rotating element. The fan-rotating element shall be nonferrous or nonsparking or the casing shall consist of or be lined with such material. There shall be ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction, necessary allowance being made for ordinary expansion and loading to prevent contact between moving parts and the duct or fan housing. Fan blades shall be mounted on a shaft sufficiently heavy to maintain perfect alignment even when the blades of the fan are heavily loaded, the shaft preferably to have bearings outside the duct and booth. All bearings shall be of the self-lubricating type, or lubricated from the outside duct.
- (5) Electric motors. Electric motors driving exhaust fans shall not be placed inside booths or ducts. See also WAC 296-24-37005.
- (6) Belts. Belts shall not enter the duct or booth unless the belt and pulley within the duct or booth are thoroughly enclosed.
- (7) Exhaust ducts. Exhaust ducts shall be constructed of steel and shall be substantially supported. Exhaust ducts without dampers are preferred; however, if dampers are installed, they shall be maintained so that they will be in a full open position at all times the ventilating system is in operation.
 - (a) Exhaust ducts shall be protected against mechanical damage and have a clearance from unprotected combustible construction or other combustible material of not less than 18 inches.
 - (b) If combustible construction is provided with the following protection applied to all surfaces within 18 inches, clearances may be reduced to the distances indicated:
 - (i) 8-gage sheet metal on 1/4-inch 12 inches.
asbestos mill board.
 - (ii) 28-gage sheet metal on 1/8-inch 9 inches.
asbestos mill board spaced out 1 inch on noncombustible spacers.
 - (iii) 22-gage sheet metal on 1-inch 3 inches.
rockwool batts reinforced with wire mesh or the equivalent.
 - (iv) Where ducts are protected with an approved automatic sprinkler system, properly maintained, the clearance required in (7)(a) of this section may be reduced to 6 inches.
- (8) Discharge clearance. Unless the spray booth exhaust duct terminal is from a water-wash spray booth, the terminal discharge point shall be not less than 6 feet from any combustible exterior wall or roof nor discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 feet.
- (9) Air exhaust. Air exhaust from spray operations shall not be directed so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes, nor directed so as to create a nuisance. Air exhausted from spray operations shall not be recirculated.
- (10) Access doors. When necessary to facilitate cleaning, exhaust ducts shall be provided with an ample number of access doors.

WAC 296-24-37007 (Cont.)

- (11) Room intakes. Air intake openings to rooms containing spray finishing operations shall be adequate for the efficient operation of exhaust fans and shall be so located as to minimize the creation of dead air pockets.
- (12) Drying spaces. Freshly sprayed articles shall be dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors. In the event adequate and reliable ventilation is not provided such drying spaces shall be considered a spraying area. (See also WAC 296-24-37019.)

[Order 76-6, 296-24-37007, filed 3/1/76; Order 73-5, 296-24-37007, filed 5/9/73 and Order 73-4, 296-24-37007, filed 5/7/73.]

WAC 296-24-37009 Flammable and combustible liquids--Storage and handling.

- (1) Conformance. The storage of flammable or combustible liquids in connection with spraying operations shall conform to the requirements of WAC 296-24-330, where applicable.
- (2) Quantity. The quantity of flammable or combustible liquids kept in the vicinity of spraying operations shall be the minimum required for operations and should ordinarily not exceed a supply for 1 day or one shift. Bulk storage of portable containers of flammable or combustible liquids shall be in a separate, constructed building detached from other important buildings or cut off in a standard manner.
- (3) Containers. Original closed containers, approved portable tanks, approved safety cans or a properly arranged system of piping shall be used for bringing flammable or combustible liquids into spray finishing room. Open or glass containers shall not be used.
- (4) Transferring liquids. Except as provided in (5) of this section, the withdrawal of flammable and combustible liquids from containers having a capacity of greater than 60 gallons shall be by approved pumps. The withdrawal of flammable or combustible liquids from containers and the filling of containers, including portable mixing tanks, shall be done only in a suitable mixing room or in a spraying area when the ventilating system is in operation. Adequate precautions shall be taken to protect against liquid spillage and sources of ignition.
- (5) Spraying containers. Containers supplying spray nozzles shall be of closed type or provided with metal covers kept closed. Containers not resting on floors shall be on metal supports or suspended by wire cables. Containers supplying spray nozzles by gravity flow shall not exceed 10 gallons capacity. Original shipping containers shall not be subject to air pressure for supplying spray nozzles. Containers under air pressure supplying spray nozzles shall be of limited capacity, not exceeding that necessary for 1 day's operation; shall be designed and approved for such use; shall be provided with a visible pressure gage; and shall be provided with a relief valve set to operate in conformance with the requirements of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code--1968. Containers under air pressure supplying spray nozzles, air-storage tanks and coolers shall conform to the standards of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code--1968 for construction, tests, and maintenance.
- (6) Pipes and hoses.
 - (a) All containers or piping to which is attached a hose or flexible connection shall be provided with a shutoff valve at the connection. Such valves shall be kept shut when spraying operations are not being conducted.
 - (b) When a pump is used to deliver products, automatic means shall be provided to prevent pressure in excess of the design working pressure of accessories, piping, and hose.
 - (c) All pressure hose and couplings shall be inspected at regular intervals appropriate to this service. The hose and couplings shall be tested with the hose extended, and using the "inservice maximum operating pressures." Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings, shall be withdrawn from service and repaired or discarded.

WAC 296-24-37009 (Cont.)

- (d) Piping systems conveying flammable or combustible liquids shall be of steel or other material having comparable properties of resistance to heat and physical damage. Piping systems shall be properly bonded and grounded.
- (7) Spray liquid heaters. Electrically powered spray liquid heaters shall be approved and listed for the specific location in which used (see WAC 296-24-37005). Heaters shall not be located in spray booths nor other locations subject to the accumulation of deposits or combustible residue. Agitators, if used, should preferably be driven by compressed air, water, or low-pressure steam. If an electric motor is used, (see WAC 296-24-37005).
- (8) Pump relief. If flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps, the pump discharge line shall be provided with an approved relief valve discharging to a pump suction or a safe detached location, or a device provided to stop the prime mover if the discharge pressure exceeds the safe operating pressure of the system.
- (9) Grounding. Whenever flammable or combustible liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to prevent discharge sparks of static electricity.
[Order 73-5, 296-24-37009, filed 5/9/73 and Order 73-4, 296-24-37009, filed 5/7/73.]

WAC 296-24-37011 Protection.

- (1) Conformance. In sprinklered buildings, the automatic sprinkler system in rooms containing spray finishing operations shall conform to the requirements of WAC 296-24-607. In unsprinklered buildings where sprinklers are installed only to protect spraying areas, the installation shall conform to such standards insofar as they are applicable. Sprinkler heads shall be located so as to provide water distribution throughout the entire booth.
- (2) Valve access. Automatic sprinklers protecting each spray booth (together with its connecting exhaust) shall be under an accessibly located separate outside stem and yoke (OS&Y) subcontrol valve.
- (3) Cleaning of heads. Sprinklers protecting spraying areas shall be kept as free from deposits as practical by cleaning daily if necessary. (See also WAC 296-24-37013.)
- (4) Portable extinguishers. An adequate supply of suitable portable fire extinguishers shall be installed near all spraying areas.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), 296-24-37011, filed 12/24/81; Order 73-5, 296-24-37011, filed 5/9/73 and Order 73-4, 296-24-37011, filed 5/7/73.]

WAC 296-24-37013 Operations and maintenance.

- (1) Spraying. Spraying shall not be conducted outside of predetermined spraying areas.
- (2) Cleaning. All spraying areas shall be kept as free from the accumulation of deposits of combustible residues as practical, with cleaning conducted daily if necessary. Scrapers, spuds, or other such tools used for cleaning purposes shall be of nonsparking material.
- (3) Residue disposal. Residue scrapings and debris contaminated with residue shall be immediately removed from the premises and properly disposed of. Approved metal waste cans shall be provided wherever rags or waste are impregnated with finishing material and all such rags or waste deposited therein immediately after use. The contents of waste cans shall be properly disposed of at least once daily or at the end of each shift.
- (4) Clothing storage. Spray finishing employees' clothing shall not be left on the premises overnight unless kept in metal lockers.

WAC 296-24-37013 (Cont.)

- (5) Cleaning solvents. The use of solvents for cleaning operations shall be restricted to those having flashpoints not less than 100°F; however, for cleaning spray nozzles and auxiliary equipment, solvents having flashpoints not less than those normally used in spray operations may be used. Such cleaning shall be conducted inside spray booths and ventilating equipment operated during cleaning.
- (6) Hazardous materials combinations. Spray booths shall not be alternately used for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition, unless all deposits of the first used material are removed from the booth and exhaust ducts prior to spraying with the second used material.
- (7) “No smoking” signs. “No smoking” signs in large letters on contrasting color background shall be conspicuously posted at all spraying areas and paint storage rooms.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 04-18-080 (Order 04-09), § 296-24-37013, filed 08/31/04, effective 11/01/04. Order 73-5, 296-24-37013, filed 5/9/73 and Order 73-4, 296-24-37013, filed 5/7/73.]

WAC 296-24-37015 Fixed electrostatic apparatus.

- (1) Conformance. Where installation and use of electrostatic spraying equipment is used, such installation and use shall conform to all other requirements contained in WAC 296-24-370 through 296-24-37027.
- (2) Type approval. Electrostatic apparatus and devices used in connection with coating operations shall be of approved types.
- (3) Location. Transformers, power packs, control apparatus, and all other electrical portions of the equipment, with the exception of high-voltage grids, electrodes, and electrostatic atomizing heads and their connections, shall be located outside of the spraying area, or shall otherwise conform to the requirements of WAC 296-24-37005.
- (4) Support. Electrodes and electrostatic atomizing heads shall be adequately supported in permanent locations and shall be effectively insulated from the ground. Electrodes and electrostatic atomizing heads which are permanently attached to their bases, supports, or reciprocators, shall be deemed to comply with this section. Insulators shall be nonporous and noncombustible.
- (5) Insulators, grounding. High-voltage leads to electrodes shall be properly insulated and protected from mechanical injury or exposure to destructive chemicals. Electrostatic atomizing heads shall be effectively and permanently supported on suitable insulators and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding the electrode system when it is electrically deenergized for any reason. All insulators shall be kept clean and dry.
- (6) Safe distance. A safe distance shall be maintained between goods being painted and electrodes or electrostatic atomizing heads or conductors of at least twice the sparking distance. A suitable sign indicating this safe distance shall be conspicuously posted near the assembly.
- (7) Conveyors required. Goods being painted using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times. Any irregularly shaped or other goods subject to possible swinging or movement shall be rigidly supported to prevent such swinging or movement which would reduce the clearance to less than that specified in (6) of this section.
- (8) Prohibition. This process is not acceptable where goods being coated are manipulated by hand. When finishing materials are applied by electrostatic equipment which is manipulated by hand, see WAC 296-24-37017 for applicable requirements. (Rev. 1-23-76)

WAC 296-24-37015 (Cont.)

- (9) Fail-safe controls. Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:
 - (a) Stoppage of ventilating fans or failure of ventilating equipment from any cause.
 - (b) Stoppage of the conveyor carrying goods through the high voltage field.
 - (c) Occurrence of a ground or of an imminent ground at any point on the high voltage system.
 - (d) Reduction of clearance below that specified in (6) of this section.
- (10) Guarding. Adequate booths, fencing, railings, or guards shall be so placed about the equipment that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant storage or personnel. Such railings, fencing, and guards shall be of conducting material, adequately grounded.
- (11) Ventilation. Where electrostatic atomization is used the spraying area shall be so ventilated as to insure safe conditions from a fire and health standpoint.
- (12) Fire protection. All areas used for spraying, including the interior of the booth, shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.

[Order 76-6, 296-24-37015, filed 3/1/76; Order 73-5, 296-24-37015, filed 5/9/73 and Order 73-4, 296-24-37015, filed 5/7/73.]

WAC 296-24-37017 Electrostatic hand spraying equipment.

- (1) Application. This section shall apply to any equipment using electrostatically charged elements for the atomization and/or, precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held and manipulated during the spraying operation.
- (2) Conformance. Electrostatic hand spraying equipment shall conform with the other provisions of WAC 296-24-370 through 296-24-37027.
- (3) Equipment approval and specifications. Electrostatic hand spray apparatus and devices used in connection with coating operations shall be of approved types. The equipment should be so designed that the maximum surface temperature of the equipment in the spraying area shall not exceed 150°F under any condition. The high voltage circuits shall be designed so as to not produce a spark of sufficient intensity to ignite any vapor-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions. The electrostatically charged exposed elements of the handgun shall be capable of being energized only by a switch which also controls the coating material supply.
- (4) Electrical support equipment. Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the handgun itself and its connections to the powder supply shall be located outside of the spraying area or shall otherwise conform to the requirements of WAC 296-24-37005.
- (5) Spray gun ground. The handle of the spraying gun shall be electrically connected to ground by a metallic connection and to be so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle.

WAC 296-24-37017 (Cont.)

- (6) Grounding--General. All electrically conductive objects in the spraying area shall be adequately grounded. This requirement shall apply to paint containers, wash cans, and any other objects or devices in the area. The equipment shall carry a prominent permanently installed warning regarding the necessity for this grounding feature.
- (7) Maintenance of grounds. Objects being painted or coated shall be maintained in metallic contact with the conveyor or other grounded support. Hooks shall be regularly cleaned to insure this contact and areas of contact shall be sharp points or knife edges where possible. Points of support of the object shall be concealed from random spray where feasible and where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor shall be so located as to not collect spray material during normal operation.
- (8) Interlocks. The electrical equipment shall be so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation.
- (9) Ventilation. The spraying operation shall take place within a spray area which is adequately ventilated to remove solvent vapors released from the operation.

[Order 73-5, 296-24-37017, filed 5/9/73 and Order 73-4, 296-24-37017, filed 5/7/73.]

WAC 296-24-37019 Drying, curing, or fusion apparatus.

- (1) Conformance. Drying, curing, or fusion apparatus in connection with spray application of flammable and combustible finishes shall conform to the Standard for Ovens and Furnaces, NFPA 86A-1969, where applicable and shall also conform with the following requirements of this section.
- (2) Alternate use prohibited. Spray booths, rooms, or other enclosures used for spraying operations shall not alternately be used for the purpose of drying by any arrangement which will cause a material increase in the surface temperature of the spray booth, room, or enclosure.
- (3) Adjacent system interlocked. Except as specifically provided in (4) of this section, drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks shall not be installed in a spraying area, but may be installed adjacent thereto when equipped with an interlocked ventilating system arranged to:
 - (a) Thoroughly ventilate the drying space before the heating system can be started;
 - (b) Maintain a safe atmosphere at any source of ignition;
 - (c) Automatically shut down the heating system in the event of failure of the ventilating system.
- (4) Alternate use permitted. Automobile refinishing spray booths or enclosures, otherwise installed and maintained in full conformity with this section, may alternately be used for drying with portable electrical infrared drying apparatus when conforming with the following:
 - (a) Interior (especially floors) of spray enclosures shall be kept free of overspray deposits.
 - (b) During spray operations, the drying apparatus and electrical connections and wiring thereto shall not be located within spray enclosure nor in any other location where spray residues may be deposited thereon.
 - (c) The spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure shall be equipped with suitable interlocks so arranged that:

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- (i) The spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure.
- (ii) The spray enclosure will be purged of spray vapors for a period of not less than 3 minutes before the drying apparatus can be energized.
- (iii) The ventilating system will maintain a safe atmosphere within the enclosure during the drying process and the drying process apparatus will automatically shut off in the event of failure of the ventilating system.
- (d) All electrical wiring and equipment of the drying apparatus shall conform with the applicable sections of chapter 296-24 WAC Part L. Only equipment of a type approved for Class I, Division 2 hazardous locations shall be located within 18 inches of floor level. All metallic parts of the drying apparatus shall be properly electrically bonded and grounded.
- (e) The drying apparatus shall contain a prominently located, permanently attached warning sign indicating that ventilation should be maintained during the drying period and that spraying should not be conducted in the vicinity that spray will deposit on apparatus.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-37019, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-37019, filed 4/19/85; Order 76-6, 296-24-37019, filed 3/1/76; Order 73-5, 296-24-37019, filed 5/9/73 and Order 73-4, 296-24-37019, filed 5/7/73.]

WAC 296-24-37021 Automobile undercoating in garages. Automobile undercoating spray operations in garages, conducted in areas having adequate natural or mechanical ventilation, are exempt from the requirements pertaining to spray finishing operations, when using undercoating materials not more hazardous than kerosene (as listed by Underwriters' Laboratories in respect to fire hazard rating 30-40) or undercoating materials using only solvents listed as having a flash point in excess of 100°F. Undercoating spray operations not conforming to these provisions are subject to all requirements of WAC 296-24-370 through 296-24-37027, pertaining to spray finishing operations.

[Order 73-5, 296-24-37021, filed 5/9/73 and Order 73-4, 296-24-37021, filed 5/7/73.]

WAC 296-24-37023 Powder coating.

- (1) Electrical and other sources of ignition. Electrical equipment and other sources of ignition shall conform to the requirements of WAC 296-24-37005 and chapter 296-24 WAC Part L.
- (2) Ventilation.
 - (a) In addition to the provisions of WAC 296-24-37007, where applicable, exhaust ventilation shall be sufficient to maintain the atmosphere below the lowest explosive limits for the materials being applied. All nondeposited air-suspended powders shall be safely removed via exhaust ducts to the powder recovery cyclone or receptacle. Each installation shall be designed and operated to meet the foregoing performance specification.
 - (b) Powders shall not be released to the outside atmosphere.
- (3) Drying, curing, or fusion equipment. The provisions of the Standard for Ovens and Furnaces, NFPA No. 86A-1969 shall apply where applicable.
- (4) Operation and maintenance.
 - (a) All areas shall be kept free of the accumulation of powder coating dusts, particularly such horizontal surfaces as ledges, beams, pipes, hoods, booths, and floors.

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- (b) Surfaces shall be cleaned in such manner as to avoid scattering dust to other places or creating dust clouds.
- (c) “No smoking” signs in large letters on contrasting color background shall be conspicuously posted at all powder coating areas and powder storage rooms.
- (5) Fixed electrostatic spraying equipment. The provisions of WAC 296-24-37015 and other subsections of this section shall apply to fixed electrostatic equipment, except that electrical equipment not covered therein shall conform to (1) of this section.
- (6) Electrostatic hand spraying equipment. The provisions of WAC 296-24-37017 and other subsections of this section, shall apply to electrostatic handguns when used in powder coating, except that electrical equipment not covered therein shall conform to (1) of this section.
- (7) Electrostatic fluidized beds.
 - (a) Electrostatic fluidized beds and associated equipment shall be of approved types. The maximum surface temperature of this equipment in the coating area shall not exceed 150°F. The high voltage circuits shall be so designed as to not produce a spark of sufficient intensity to ignite any powder-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under normal operating conditions.
 - (b) Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the charging electrodes and their connections to the power supply shall be located outside of the powder coating area or shall otherwise conform to the requirements of (1) of this section.
 - (c) All electrically conductive objects within the charging influence of the electrodes shall be adequately grounded. The powder coating equipment shall carry a prominent, permanently installed warning regarding the necessity for grounding these objects.
 - (d) Objects being coated shall be maintained in contact with the conveyor or other support in order to insure proper grounding. Hangers shall be regularly cleaned to insure effective contact and areas of contact shall be sharp points or knife edges where possible.
 - (e) The electrical equipment shall be so interlocked with the ventilation system that the equipment cannot be operated unless the ventilation fans are in operation.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), 296-24-37023, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), 296-24-37023, filed 4/19/85; Order 76-6, 296-24-37023, filed 3/1/76; Order 73-5, 296-24-37023, filed 5/9/73 and Order 73-4, 296-24-37023, filed 5/7/73.]

WAC 296-24-37025 Organic peroxides and dual component coatings.

- (1) Conformance. All spraying operations involving the use of organic peroxides and other dual component coatings shall be conducted in approved sprinklered spray booths meeting the requirements of this section.
- (2) Smoking. Smoking shall be prohibited and “no smoking” signs shall be prominently displayed and only nonsparking tools shall be used in any area where organic peroxides are stored, mixed or applied.

[Order 73-5, 296-24-37025, filed 5/9/73 and Order 73-4, 296-24-37025, filed 5/7/73.]

WAC 296-24-37027 Scope. This section applies to flammable and combustible finishing materials when applied as a spray by compressed air, “airless” or “hydraulic atomization,” steam, electrostatic methods, or by any other means in continuous or intermittent processes. The section also covers the application of combustible powders by powder spray guns, electrostatic powder spray guns, fluidized beds, or electrostatic fluidized beds. The section does not apply to outdoor spray application of buildings, tanks or other similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

[Order 73-5, 296-24-37027, filed 5/9/73 and Order 73-4, 296-24-37027, filed 5/7/73.]

WAC 296-24-450 Chlorine cylinders used in chlorinator systems. Ventilation, storage of tanks and use of tanks shall meet specifications of The Chlorine Manual, The Chlorine Institute, Inc., fifth edition, 1986.

[Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), 296-24-450, filed 1/10/91, effective 2/12/91; Order 74-27, 296-24-450, filed 5/7/74.]